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CQ

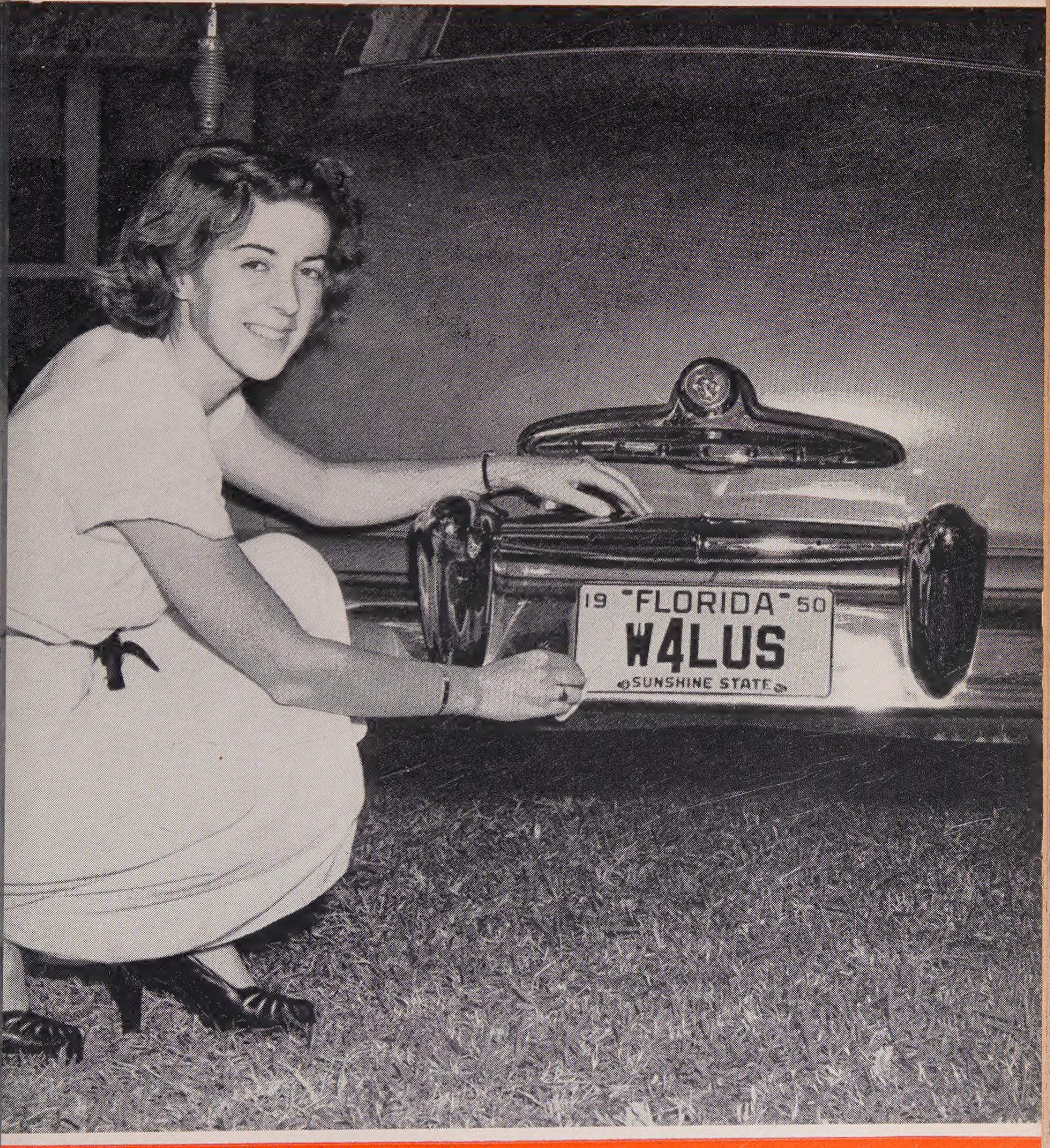
MAY, 195

IN THIS ISSUE

- Designing Class C Power Amplifie
- A 2-Tube Superhet for the Beginn
- Variable Selectivity with the FL
- TVI Elimination in your 28-Mc R

35 Cen

The Radio Amateurs' Journa



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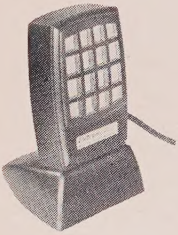

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Vol. 6 May, 1950 No. 5

In This Issue

OUR COVER—With the mobile season upon us, we feel this photo of W4LUS's XYL dusting off the license plate on the family chariot is a harbinger of happy days on the open road for the mobile gang. If you're not set up for mobile why not see what can be done? (The front end of Al's car, after an untimely tiff with a telephone pole, is illustrated on page 56.)

Scratchi 4
Letters 6
Zero Bias (*Editorial*) 9
Class C Power Amplifier Design
K. L. Klippel, W0SQO 11
FCC Commissioner Warns Us of Dangers 15
Walkie-Talkie for the 144-mc Band
Gus Treuke, W6DSR 16
Eliminating TVI on Ten Meters
Solomon Kupferman, W2GVT 18
Meet the Capacitor
Robert L. Rod, W2KVY 22
The Minirec, a Midget Communications Receiver
Roger C. Amundsen, W1HYF 25
Our "Home Brew" Contest 27
Variable Audio Selectivity with the FL–8
John P. Tyskewicz, W1HXU 28
Completing the 20-Meter Rotary Beam
William I. Orr, W6SAI 29
Mobile Corner 33
The MARS Page 34
Action Near on New Amateur Regs 35
V.H.F.—U.H.F. 36
DX and Overseas News 38
WAZ Honor Roll 39
The YL's Frequency 42
The Monitoring Post 44
The 6-Meter Observing Project 46
The Social Side (*Hamfests and Conventions*) 50
Advertising Index 71

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The No. 90651 MILLEN GRIP DIP METER is compact and completely self contained. The AC power supply is of the "transformer" type. The drum dial has seven calibrated uniform length scales from 1.5 MC to 300 MC plus an arbitrary scale for use with the 4 additional inductors available to extend the range to 220 kc. Internal terminal strip permits battery operation for antenna measurement.

JAMES MILLEN MFG. CO., INC.

MAIN OFFICE AND FACTORY
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MASSACHUSETTS

Feenix, Ariz.

Deer Hon. Ed:

Man the Hon. Gain Control, furl your antenna, and otherwise de-sensitive your receiver, Hon. Ed. because Scratchi is coming on with the most sooper-stoopendous signal you will ever be heering on the ham bands. You are heering of California Kilowatts? Ha. I are about to putting on Arizona Kilowatt which are making Calif. kilowatts look like walkie-talkies with weak batteries.

Wiping that smile off your face, Hon. Ed. on acct. Scratchi are not kidding this time. I are going to *high* power. This is all coming about when I are receiving the data sheet on the 5831 toob. This new toob are made by some company back east called RCA. Say, I wonder if this company are any relation to the UV or the UX company? All of Scratchi's toobs are marked either UV or UX and they are all working FB for the past 22 years. Of course it not mattering, because any company that can bring out a toob like the 5831 must be hot-shots company.

Are you realizing that this toob are rated for *one million watts* input!! Hokendoke Hackensaki, think of the signal I can putting on 20 meters with a 5831. I'll bet I can blocking all receivers in a radius of a cupple of hundred miles. Get ready, AC4YN, here I come!! (Or are you thinking that this will be too easy?)

Of course there are more to this than meeting the eye. You just can't buy a 5831 and plug it in a socket and go on the air. By gollies, us big shot high power men are having reel problems. For examples, the filament on this toob are only taking six volts, but it are drawing 2,220 amperes at this voltage. Hmmm, you knowing, Hon. Ed., I may having to parallel several filament transformers to get this current.

In fact, the more I thinking about that 2,220 amperes the more I thinking I'll have to use something heavier than number 12 wire to make the filament connections. Maybe I can get some old railroad tracks, or if they too small maybe some twelve-inch by twelve-inch I-beams will do. I don't want to have any voltage drop in the filament leads.

There are not being much trubble with plate current, as here are only drawing about 40 amperes, unless using pair of these toobs as modulators, then will be needing to have about 60 amperes available at 10,000 volts. You know, it are taking quite a bit of power to run a megawatt toob. In factly, it are taking well over one million watts.

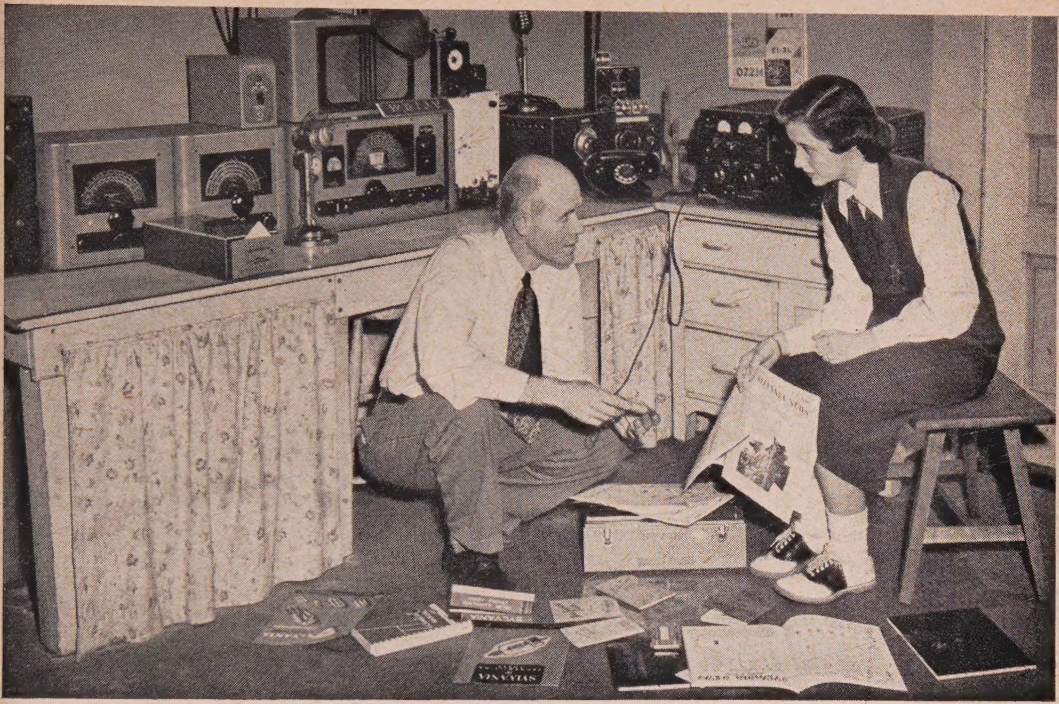
Another small problem is the fact that this triode toob are needing water cooling. Data sheet are saying that 60 gallons per minute are adequate. Needing all this water it are sure lucky that Scratchi are not living in New York City.

Brother Itchi are telling me that I not being able

(*Continued on page 72*)

"Sylvania sure makes the ham's job easier,"

says Mr. Warren Bauer, W8IJV



MR. BAUER is one of many radio amateurs who is enthusiastic about the wide variety of helpful material that Sylvania offers to Radio Hams.

"Look," he says, "Sylvania sent me this fine Test Prod Ohmmeter, these handy tool kits, metal file box, plus these technical manuals, and binders, for only $17.45. In addition, they sent me *free,* these valuable hint books, color code cards, transmitting and receiving characteristic sheets, and an Ohms law chart."

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★ ★ *Letters* ★ ★

Our Editorial Stand

4213 Fourth St., S.E., Washington 20, D. C.

Editor, *CQ:*

With reference to your splendid editorial in March *CQ*, I feel certain that the manner in which you have presented the picture will go far toward the achievement of a true spirit of unity within the amateur ranks.

Lyman C. Millard, Jr., W3DQB

167 Elm St., Struthers, Ohio

Editor, *CQ:*

Your editorial "Zero Bias" seems to me to be the most down-to-earth statement of the amateur problem yet printed, or for that matter, presented in any form. . . . We are indeed fortunate in having an independent publication which can afford the time and space to print the truth.

A. L. Wilson, W8VBV

Overseas GI Traffic

Hokkaido, Japan

Editor, *CQ:*

Why is it that when we fellows want to try to get a contact through with our families on the East Coast there is never a peep out of the W3s and thereabouts—yet when a DX contest comes around they come booming in here like the local BC station?

How about tipping off these fellows to be on the lookout once in a while for the JAs with traffic?

Cpl. B. G. Wilmarth

HAI

1540 55 St., Sacramento, Calif.

Editor, *CQ:*

With all the new and different ways to cure TVI and BCI, I thought you might like to hear of a new and different kind of interference called "HAI" or "hearing aid interference."

My father, W6HSB, was relaxing in the armchair in the front room and I was checking out our new SCR-522. All of a sudden he cried out, "Get out of my ear!"—and I had HAI. I wonder if anyone else has had this type of interference, and if anyone has a cure for same?

Jay O'Brien, W6GDO

Docket 9295 Again

89–19 78th Street, Woodhaven, N. Y.

Editor, *CQ:*

Anent the proposed new regulations, wish I knew what started all this sudden rumpus? We hams would be all right if they'd just let us alone instead of making our life tougher as each year goes by. Something really ought to be done, though, about the morons who get on the air and just kid around, and are forever breaking in on a QSO with what they think are witty remarks. This is my pet gripe and it doesn't do ham radio any good, either.

N. V. Bradshaw, W2ELN

Low Power DX Contest

Box 224, Millington, Tenn.

Editor, *CQ:*

How about sponsoring a world-wide DX contest paralleling the yearly *CQ* DX contest *except* limit the power input to 100 watts for all W and VE stations? Maybe that would give the average ham a sporting chance against the BIG KW rigs with their million-dollar antenna systems.

C. W. Wade, W4NNJ

ZERO BIAS

EDITORIAL

In the final analysis *CQ*, as well as any other magazine, is run by its readers. Whether a magazine is the official organ of a "non-profit" organization, or whether its publication is a business venture, its policies and content must be determined by those who provide the month-to-month support. We try, each month, to "balance the book" in accordance with what we believe to be the desires of our readers, but we're never *sure*, when we omit something, whether or not that something might not be the very thing you enjoy the most. We are, therefore, taking this opportunity to ask you to express your preference, both for the types of articles you like to see included in *CQ*, and for the department or departments you like best.

You will find, bound between pages 24 and 25 of this issue, a business reply card, requiring no postage, which will give you your vote in determining the content of *CQ*. If you'd like a better *CQ*, check the appropriate squares on the card and drop it in the mail at your first opportunity. We'll keep a log of the cards as they come in, and we'll let you know how the "election" comes out. We'd appreciate it if every one of you readers, both subscribers and newsstand buyers, would let us know how you want *CQ* made up.

Ham Clubs

We've traveled around the country quite a bit, and have attended meetings of nearly a hundred different ham clubs during the past sixteen years. During that period of time, it has become increasingly apparent to us that the ham club is the seat of true democracy in amateur radio, and that a strong and informed body of ham clubs throughout the country is the best assurance that our avocation will enjoy a bright future. We know of no crisis in ham radio, from the BCI days of the '20s to the TVI days of the late '40s, which the ham clubs haven't been instrumental in solving. Very few important technical developments in the history of ham radio have not been seized upon as topics of discussion by forward-looking club members before the rank-and-file ham was able to learn all about them. The ham club is both the forum and the class-room of ham radio. We like clubs.

For quite a while we've been devoting a lot of thought to the possibility that there might be something that *CQ* can do to assist the ham clubs. Since *CQ* is primarily a medium for the spreading of information, the job of seeing that as many ham clubs as possible are in the "well-informed" class seems to be our meat.

We think we've come up with something no other magazine has done, in the interest of spreading of information, both technical and regulatory. We are offering a free one-year subscription to *CQ* to every ham club in the country. The subscription can be entered in the name of any club officer or club member you wish. All that is necessary to get the free subscription for your group is to have one of your officers write us a letter giving the name and address of your club and the mailing address to which you want the monthly issues of *CQ* sent. Please address the letter to: *Club Subscription Department, CQ Magazine, 342 Madison Ave., New York 17, N. Y.*

Remember, a free *CQ* subscription to every ham club in the country is available—let us hear from *your* club.

The Home Brew Contest

As we write this, the March issue of *CQ*, containing the announcement of our $1,000 Cash Prize "Home Brew" contest for home constructors, has been on sale for less than two weeks. We expected to receive quite a few entries, but nothing like the mass of documents which have been pouring in during the past few days. It looks as though our effort to stimulate home construction of ham gear is going to be the biggest thing to hit our hobby in many a year. Keep them coming—we can take it as long as you fellows can dish it out!

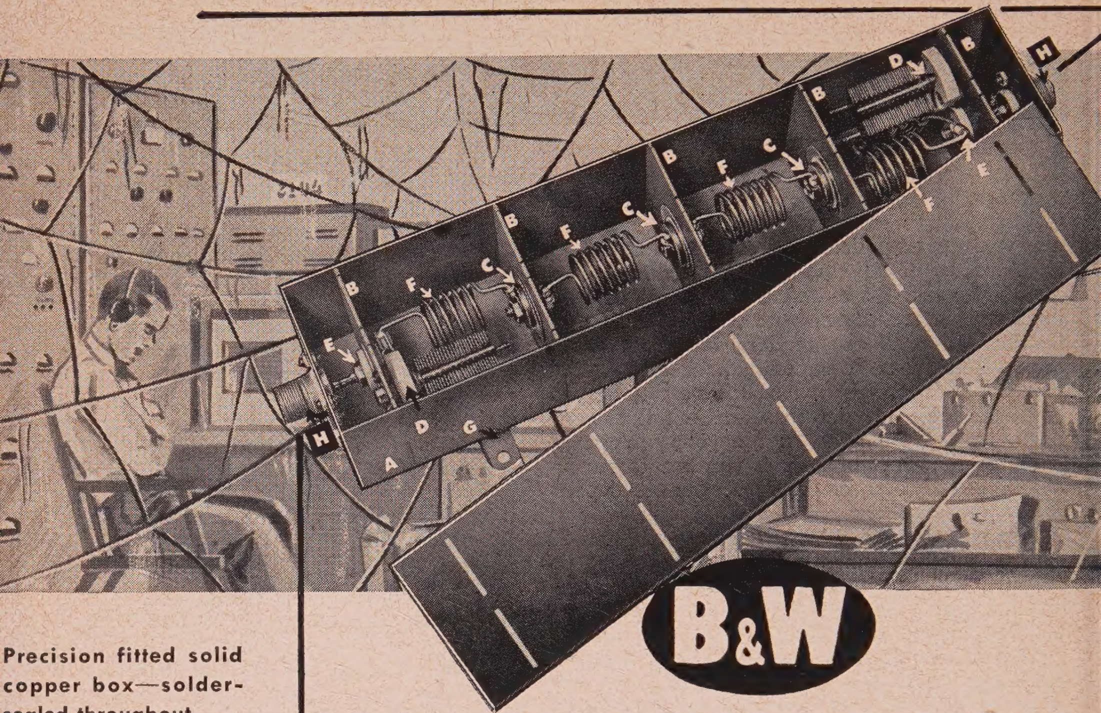
We have been fortunate in obtaining the services, as judges, of three leading hams in the New York area—Larry LeKashman, W2IOP, former Editor of *CQ* and presently in the Advertising and Sales Promotion Section of the Tube Division of RCA; George Floyd, W2RYT, of the Industrial & Transmitting Tube Sales Section of the Electronics Department of General Electric and Editor of *G.E. Ham News;* and Bill Scherer, W2AEF, whom you all know as one of the best home-brewers in the game. (Frankly, we got Bill to become a judge to keep him from walking off with one of the big prizes himself. Remember the "Gold Plated Special?")

From the way the entries have been coming in, it looks as though our triumvirate of judges are going to have their hands full when judging time rolls around.

If you are one of the many hams who delight in building good workable equipment, this contest is your meat. Get that copy of March 1950, *CQ* down from the shelf and look those rules over again. There is plenty of time left for you to get your entry to this office, and, who can tell . . . you might win the $250 First Prize.

LET'S LICK TVI

and brush the cobwebs off the rig



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- *Low in cost . . . Easily installed*

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Complete details on how you can banish TVI are available in *Filter Facts*—packed with each Low Pass Filter. See your dealer today!

BARKER & WILLIAMSON, Inc.

237 Fairfield Ave., Upper Darby, Pa.

esign Considerations for Class C Power Amplifiers

K. L. KLIPPEL, W0SQO*

Here's a paper which should take a lot of the mystery out of class C amplifier design, and which should enable many of us to improve our rigs.

E PROBLEM OF GENERATING RADIO FREQUENCY OWER and radiating it is as old as the art of o itself, and over a period of many years sev- techniques have evolved that have proved nselves. The person who has a professional or teur interest in radio communication has had earn certain fundamentals and their applica- , and, while a complete understanding of the y mysteries of the art is reserved for a few damentalists, a working knowledge of it may btained by a large number. Certain handbooks other publications offer a great deal of assist- to those who desire to construct equipment , in general, most of the equipment described been designed to incorporate certain principles h have been favorably recognized by the en- ering profession.

nfortunately, most amateurs, when attempting onstruct some of the equipment so described, forced to make a number of compromises for ons of economy because the components on d never seem to be quite the same as those ined in the parts list of the equipment under truction. The expressed purpose of this dis- ion, therefore, is to outline certain principles procedures that anyone may follow so that a f guesswork may be eliminated in that part he transmitter where poor compromises can me fairly serious; namely, the class C power lifier.

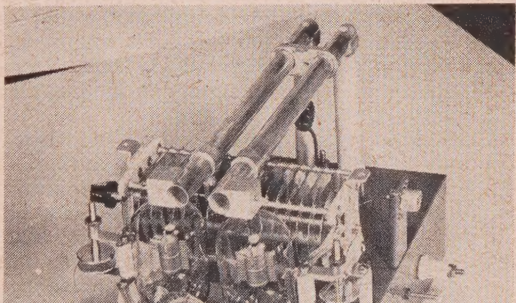
his type of amplifier has found wide accept- largely because of its high efficiency and ive ease of adjustment, but the reason for its efficiency is also reason for concern. By defi- n, this type amplifier has its grid biased to or three times the amount required for plate ent cut-off so that no plate current will flow the excitation reaches sufficient level to cause instantaneous grid potential to no longer ess that value needed for cut-off. Since the point is far beyond cut-off and the waveform e exciting voltage is sinusoidal, the tube is conducting during a small portion of a cycle e exciting voltage and the plate current flows lses. Since these pulses of current appearing e plate circuit are no longer sinusoidal, they ain a high percentage of harmonics and, as ult, the plate load must be carefully designed der to insure reasonable output efficiency and uation of these higher order harmonics gen- d in the tube plate current.

In order to describe adequately the principles involved, considerations of each portion of the power amplifier will be discussed, and then a typical design problem will be outlined.

First, the type of operation must be known and should include frequency range, power input and type of emission. From the above-assigned conditions, a power amplifier tube should be selected with particular regard to its ratings in terms of power capability, driving power, cost, and frequency range. If c.w. emission only is planned, it is necessary to select a tube that has a plate dissipation equal to about one-third of the carrier power, but if plate modulation is desired, the plate dissipation rating should be equal to about one-half of the carrier power. In the event that v.h.f. operation is desired, one should take care to select a tube having low inter-electrode capacities.

Push-Pull or Parallel?

After the tube has been selected, it is necessary to select the circuit to be employed. Personal preference generally dictates to a large extent the type to be used, but for general use the circuit



The design considerations and procedures discussed here hold good even in the v.h.f. range. Coils and condensers may change their looks, but the C, L, and Q of the formulas are still with us.

---

llins Radio Co., Cedar Rapids, Iowa.

will generally resolve itself into a single-ended or push-pull grounded-cathode amplifier which will be either shunt or series fed. Many amateurs feel that the push-pull type amplifier is superior, particularly because of its inherent cancelling of second harmonic output. However, in practice, this cancelling effect is not simple to accomplish and depends upon perfectly balanced conditions. A single-ended amplifier is easier to construct, takes less space and can be made to reject harmonics satisfactorily. The exception to this is the application wherein parallel operation is desired of tubes having a fairly high input capacitance and the output frequency to be employed is 28 mc or higher. Under these conditions, it is sometimes difficult to obtain good efficiency. The decision to use either a pentode or triode tube is largely dependent upon personal choice as well as the general considerations listed before. However, in these days of reasonably-priced tetrodes, it is difficult to justify triode type tubes with their high driving power requirements and neutralizing difficulties over a wide range of frequencies. The high drive required means that more care must be taken to eliminate TVI, and, in spite of the advantages of triode tubes, it is the opinion of this writer that tetrode tubes are to be preferred, particularly in high power applications.

Series Feed or Parallel Feed?

The next consideration is whether series or parallel plate feed shall be used. In medium power transmitters it is probably simpler to feed the d.c. to the plate of the tube directly through the cold end of the plate coil. This means that the d.c. voltage will appear across the plates of the tuning capacitor if its rotor is grounded, which may cause it to break down. If the rotor is ungrounded and connected directly to the coil, it is necessary to use an insulated shaft coupler so that no d.c. will appear on the tuning knob. When series feed is used, it is necessary to by-pass the bottom end of the plate coil.

Parallel plate feed allows one to ground both the cold end of the coil and the rotor of the variable capacitor, and in high power application this means a considerable saving in size and cost of the tuning capacitor. This is true because the spacing between condenser plates need only be adequate to withstand the r.f. plus modulating voltage and not the d.c. voltage. The blocking capacitor between the plate and tank circuit should have a value of capacitance at least equal to that of the tuning capacitor. As a general rule, it should not exceed .002 µf if phone operation is contemplated because of the shunting action on the modulator output. The selection of the r.f. choke which carries the d.c. to the plate of the tube is very important. Its wire size must be sufficient to handle the desired d.c. plate current and modulator a.c. current without undue heating. Its reactance at the lowest frequency to be used should be approximately ten times the load impedance of the tube, and even more important is the requirement that the choke not go series resonant at a frequency falling in or near any amateur band to be used. A fortunate fact is t
there is no doubt about whether or not this h
pens once the circuit is tested on all amat
bands, because if this series resonant condit
exists, the choke immediately burns up. Sev
fairly satisfactory chokes are manufactured c
mercially, but some of these go series reson
in the vicinity of 21 mc.

Driving Problems

Power from a driver source must be supp
to the amplifier tube to excite it. The driv
voltage and power required are always shown
the manufacturers data sheet. As outlined abo
the plate current of a class C stage contains h
monics and since the driver stage is nearly alw
a class C stage, its output contains these h
monics even though they have been somew
attenuated by the tank circuit of the driver. T
power from the driver must be coupled in usa
form to the amplifier. In the past the term "u
ble form" has been construed to mean any fo
that yields adequate grid current. In the light
our forced recognition of the reduction of spuri
radiations, it must be recognized that this al
is not enough. A much better solution is the
of correctly-designed grid tank circuit, l
coupled to the driver tank circuit. The PA g
tank should not be simply any *L* and *C* t
resonate at the desired frequency, but should
properly designed to obtain the highest possi
filtering action that is consistent with good effi
ency. Some of our more experienced design
gineers have concluded that an effective *Q* of
meets these requirements. In order to simp
the calculations necessary to arrive at the pro
values of *L* and *C*, a table of typical values
shown in *Fig. 1*. It is only necessary for one
examine the characteristics of the tube to be u
and note the required driving power and volt
and then to select the appropriate value of cap
ity. The inductance may be calculated from
reactance rule, or by formula. It should be poin
out that these values of capacity are minim
values and that in practice operating values
to double those shown are permissible. If the a
plifier is a neutralized triode, then two times
neutralizing capacity is considered as a part
the total required capacity. If the RMS g
driving voltage is unknown, it may be assum
to be approximately equal to the negative op
ating grid bias.

In general, the power rating of the grid ta
should be at least twice the required grid driv
power, and the old practice of using a high *L*
ratio or loading the inductance with a resistor
"broad-band" it should never be resorted to.

The next step to accomplish in the design
the calculation of the tank circuit paramete
Obviously this is one of the most important st
in the entire design so that full power output a
maximum harmonic attenuation may be realiz
One calculation procedure is as follows:

1. Calculate the plate power input

$$P_{in} = E_{dc} \times I_p$$

2. Take the plate power output value from the manufacturers data, or assume it to be 75% of the power input.
3. Verify the fact that the difference between power input and power output does not exceed the value of rated plate dissipation for the tube to be used.
4. Calculate the a.c. plate current from the expression:

$$I_{ac} = \frac{2 \times P_{out}}{E_b - E_{min}}$$

where E_b is the d.c. supply voltage and E_{min} is approximately equal to $0.2 \times E_b$ for triodes, or approximately equal to the screen voltage in the case of tetrodes.

5. The tube (plate to cathode) load impedance is then calculated as follows:

$$Z_L = \frac{E_b - E_{min}}{I_{ac}}$$

6. Select an operating *Q* of between 12 and 15 for the tank circuit.
7. Calculate the required inductance for each band of operation from the following expression:

$$L = \frac{Z_L}{Q_{oper} \times 2\pi f}$$

where L = inductance in millihenries, Z_L = the load impedance in ohms *Q* = selected operating *Q* and f = operating frequency in kilocycles.

8. Calculate the total tuning capacitor needed to resonate with the calculated inductance either by using a calculator or from the formula $X_c = X_L$. $C = \frac{1}{4\pi^2 f^2 L}$, which reduces to $C = \frac{25{,}200{,}000}{f^2 \times L}$ where *C* is in μμf, *f* in kilocycles and *L* in millihenries. In order to obtain the proper value for the tuning capacitor, it is necessary to subtract the tube output capacitance from the calculated total tuning capacitance.

It should be recognized that these values of *L* d *C* are for single-ended operation and in the ent that a "split tank" is used, these values are ose needed for each half of the symmetrical nk circuit.

The above-mentioned calculations essentially mplete the electrical design of the amplifier. owever, in order to select components, there are few more calculations that should be accomished.

The efficiency of the tank circuit may be callated from the expression

$$\text{Eff} = \frac{Q_c - Q_o}{Q_c} \times 100$$

here Q_c = the *Q* of the plate coil and Q_o = opering *Q*. It can be readily seen from this expresn that the efficiency of the tank circuit deeases when the operating *Q* is raised. Since few amateurs possess equipment capable of measuring the coil *Q*, it will have to be approximated. A coil of fairly heavy wire possessing a form factor where its length is approximately 2½ times its diameter will nearly always have a *Q* of 200, and a coil has to be pretty poor to have a *Q* below 100 at amateur frequencies below 28 mc.

DRIVING POWER IN WATTS	RMS GRID DRIVING VOLTAGE	CAPACITY IN μμf 80M	40M	20M	10M
2.5	50	900	450	225	112
	100	225	112	62	28
	200	51	28	19	7
5	50	1800	900	450	225
	100	450	225	112	56
	200	112	56	28	14
10	50	3600	1800	900	450
	100	890	445	223	112
	200	220	110	55	27
25	100	2200	1110	550	275
	200	360	180	90	45
50	100	4400	2200	1100	550
	200	700	350	175	88

Fig. 1. See text.

The calculated tank efficiency is then multiplied by the plate power output, and, since the efficiency is always less than 1, the tank power output will be somewhat less than the plate power output. The difference between the two values is the power that the coil must dissipate. The wire size must be sufficient so that the coil can dissipate this much power without much heating because if it heats too much its effective resistance increases with a corresponding loss in *Q*, and therefore efficiency. A poorly-designed coil often gets hot enough to melt soldered connections made to it.

Breakdown Voltage

In order to select a tuning capacitor with adequate spacing, it is necessary to calculate the effective voltage across the tank circuit. This calculates as follows:

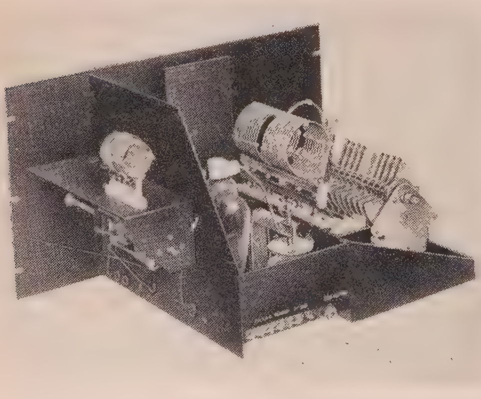
$$E = \sqrt{P \times 2\pi f L \times Q_{oper}}$$

where *E* is in volts, *f* in kilocycles and *L* in millihenries. The value so calculated will represent that value present when the amplifier is loaded to the values used for the initial calculations. This voltage will increase somewhat when the stage is unloaded, but if some safety factor is allowed, no arcing will occur. The peak voltage under no modulation conditions will approach, but not equal, the d.c. supply voltage, so, in general, a good rule of thumb is to treat this voltage as though it were of the same magnitude as the supply voltage and avoid calculating its exact value. In the event that high level modulation is to be employed, the peak voltage will be essentially doubled under conditions of 100% modulation. This means that the tank circuit of a modulated power amplifier will have a peak voltage of approximately twice that of the d.c. source if shunt feed is employed. Series feed with a grounded capacitor rotor will increase this voltage to four times that of the d.c. source.

One more convenient relationship to know is that the circulating tank current is equal to $Q_{oper} \times I_{ac}$ where I_{ac} is the a.c. plate current. So for an operating *Q* of 12, the tank current is twelve times as great as the a.c. plate current. Since this current flows largely on the outside of the conductor, it is wise to have as large a conductor as feasible. It also means that switch contacts, banana plugs or similar devices in the tank circuit should be capable of standing this current, and in high power applications this is sometimes fairly difficult to accomplish.

At this stage, it would perhaps be wise to include a hypothetical design problem. Assume that one desires to construct a phone transmitter described in some publication and has most of the parts, but not the same h.v. supply or PA tube. The exciter portion of the transmitter has a power output of ten watts. Examination of the junk box shows that power supply components are on hand for constructing a 900 v. supply. A further checkup shows that the following tubes are on hand; an 807, TZ40, and a 4-65A. Examination of the tube characteristics shows that the 807 must be ruled out because it cannot be used with such high plate voltage. For high level modulated amplifier operation, a TZ-40 has sufficient power capabilities but its required driving power is 7.5 watts. This tube could probably be used, but the drive would always be marginal because it is fairly difficult to obtain a coupling network that is 75% efficient. It is much better to have at least twice as much power output from the exciter as is needed to drive the grid of the amplifier.

The 4-65A data shows that this tube could easily be used under the aforementioned conditions. It requires but 2.5 watts of driving power and in the event that the d.c. plate source has sufficient current capability two of these tubes may be used in parallel to double the power output.



One of the reasons for the smooth operation of most commercial class C amplifiers is careful engineering.

Designing a Single Tube Amplifier

Now that the tube has been selected, the actual design for a single tube amplifier may be made as follows:

To select the value of the grid tuning capacitor it is necessary to refer to the tube data sheet and also to *Fig. 1*. According to the data sheet the driving power required is 2.5 watts and the peak grid input voltage should be 210 volts. The RMS grid voltage is equal to 0.707 of the peak, or 150 volts. Since the chart does not have any values of *C* shown for 150 volts or so, it is necessary to interpolate between 100 volts and 200 volts, or to calculate the required *C*. Since the graph is self-explanatory, we will calculate the capacity a follows:

$$X_c = \frac{E^2}{QP}$$

$$X_c = \frac{E^2}{20 \times P}$$

where E = 150 volts and P = 2.5 watts

$$X_c = \frac{150^2}{50} = \frac{22500}{50} = 450 \text{ ohms}$$

$$450 = \frac{10^6}{6.28 \times 3.5C} \quad C = 101\ \mu\mu f,$$

so for 3.5 mc use C = 100 μμf.

By identical calculations, the necessary grid capacitances for the other bands are as follows:

7 mc, C = 50 μμf
14 mc, C = 25 μμf
28 mc, C = 13 μμf

At this stage, the plate tank circuit parameters may be calculated as shown below:

$P_{in} = 900 \times 0.120,$

where the 0.120 is the rated plate current

$P_{in} = 108$ watts

$P_{out} = 108 \times 0.75 = 81$ watts

Rated plate dissipation is 65 watts. Actual dissipation (without modulation) = 108-81 or 27 watts

The a.c. plate current should now be calculated

$$I_{ac} = \frac{2 \times 81}{900 - 250}$$

(250 is the screen voltage, and E_{min} will approach that value.)

$$I_{ac} = \frac{162}{650} = 0.25 \text{ amps}$$

The load impedance is then calculated

$$Z_L = \frac{900 - 250}{0.25} = \frac{650}{.25} = 2600 \text{ ohms}$$

Assume a *Q* of 12 and calculate the tank inductance and capacitance.

1. (3.5 mc) $L = \frac{2600}{12 \times 6.28 \times 3500}$
$= .0098\text{mh}\ (9.8\ \mu\text{h})$

(*Continued on page 56*)

FCC Commissioner Warns of Dangers to Amateur Bands

". . . the crisis we are facing in radio communication today . . ."

FCC Commissioner E. M. Webster speaking to the New York Chapter of the Armed Forces Communication Association on January 25, 1950, on the subject, "Frequency Resources and National Policy," touched on points of vital interest to ALL amateurs. A longtime friend of the amateur, Commissioner Webster is an outstanding authority on frequency allocation. He was a key figure at the Atlantic City Conference and has participated in 21 international conferences dealing with communication problems during his long and highly successful career.

CQ excerpts brief quotes from his most significant paper:

"I want to talk tonight (about) the crisis we are facing in radio communication today from the standpoint of our national interest.

"I am thoroughly convinced that the day is gone when a group of technicians from different countries of the world can get together in a room and work out their telecommunications problems in quiet harmony. Today political, economic, and social problems also enter the picture.

"There is no way of expanding the frequency spectrum.

"(A criterion) is the use that is made of . . . frequencies in terms of the relative importance of the task at hand and the efficiency.

"We are also faced with the problem of expanding those services ('the newer communication services of high frequency broadcasting and aviation') without wiping out essential uses in the fixed, maritime and amateur bands. I suggest you think this through carefully on a broad basis as to what is best for this nation."

Queried on the problem of amateurs and frequency allocation, Commissioner Webster made this special statement for the readers of *CQ:*

"Amateurs will have to make every effort to protect their frequencies against more than minimum encroachment. Future frequency allocations between the various services can only be on a basis of relative merit and will undoubtedly include a consideration of the efficiency of usage. Justification of frequency occupancy will be required of all users at the many conferences now scheduled, including the general conference for Beunos Aires in 1952.

"Be prepared!"

Commissioner Webster's remarks about the effectuation of the "Atlantic City Frequency Table", of interest to us because of the 21-mc band, bear careful study:

"At the Atlantic City Conference in 1947 an allocation table of bands of frequencies for services was adopted which provided for increased spectrum space for aviation and high frequency broadcasting at the expense of the fixed and maritime services. This table is of no practical benefit to us, however, until each of the four high frequency services, aeronautical, marine, fixed, and broadcasting develop plans for the assignment of frequencies within the allocations adopted at Atlantic City for each of these services. It soon became apparent that the time required for working out the necessary plans to accomplish this goal would far exceed the time any members from any country could remain at Atlantic City. As a result, special machinery was set up to handle the specialized problems of the different services and to fit them into a master plan which could then be reviewed at another world conference to be held at a later time.

"This machinery consists mainly of two components: The Provisional Frequency Board for the high frequencies, and Regional Conferences for the bands below 4000 kc. When the Provisional Frequency Board has completed its work, this master plan will be forwarded to a special radio conference which will review all the work for all the services and all the regions since Atlantic City in 1947. If this conference can approve or revise the plan of the Provisional Frequency Board in a manner that will be acceptable to a majority of the nations of the International Telecommunication Union, the problem of imple-

(*Continued on page 52*)

E. M. Webster

Crystal-Controlled Walkie-Talkie for Operation on the 144-mc Band

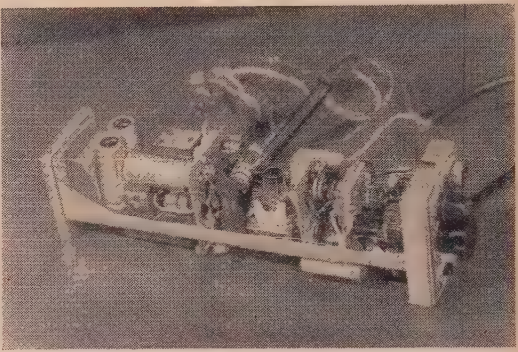
GUS TREUKE, W6DSR*

This little unit approaches the ultimate of portability with self-contained dry-battery power and a "built-in" antenna. If you like your ham radio "on the hoof," you've got it here.

FACED WITH a transcontinental trip by train, bus, or what-have-you, with all kinds of time to do it in had little appeal to the writer if it were to be minus ham radio. In order to fill in this deficiency, the transmitter-receiver described in this article was designed and constructed. Operation in the 144-mc band with a signal above reproach was decided upon. Crystal control seemed to be the best means of achieving this end, so in the interest of simplicity, a 48-mc crystal was first chosen. After many circuit combinations were tried, the 48-mc crystal was discarded in favor of a 24-mc crystal, which in turn was discarded in favor of a 12-mc rock. The layout described in this article has proved to be the most satisfactory of many tried.

Portability

The transmitter-receiver was built on an aluminum chassis 2½ by 3 by 10 inches. The metal case into which this chassis fits slides into a compartment of the leather carrying case; the other compartment houses the dry batteries with which this combination is powered. Ninety volts of B battery is employed as the plate supply. In the interest of economy this is taken care of by four Eveready 482 45-volt batteries in a parallel-series combination. The life of the batteries in this combination far exceeds that which may be expected of the four were they to be used as two sets of two each. Because the action of the push-to-talk relays was not positive with a 1½ volt supply, 3 volts was chosen as the filament supply. This is taken care of by two Eveready 742 batteries in series. An adjustable shoulder strap was provided for packing the combination around, and the weight hasn't proved to be too burdensome to the writer on some rather extensive hikes. However, since the bulk of the weight is in the batteries, a substantial weight reduction may be achieved at the expense of economy by employing two instead of four B batteries for the 90-volt supply.


The above-deck view, with the chassis slid out of its aluminum can. The parts layout is described in the text.

The below-deck view. The acorn tube to the right of center is one of the 958As of the push-pull final. The acorn tube at the extreme right is the 957 detector.

Battery Economy

"Push-to-talk" operation is employed, and once contact has been established, it is only necessary to press the "mike" button to transmit and release it to receive. This button controls the action of two relays which transfer the filament and plate supply from the receiver to the transmitter section whenever the push-to-talk button is depressed. Thus, when receiving, all transmitter filaments are off, and when transmitting, all receiver filaments are off. This minimizes battery drain and provides a very simple low-loss means of transferring the antenna from the receiver to the transmitter and vice versa. The push-pull transmitter final tank circuit is coupled to the collapsible quarter-wave antenna in the usual manner. The grid of the r.f. amplifier of the receiver is capacitively coupled to one side of this tank circuit. Since the receiver filaments are off when transmitting, the only effect of this will be an unbalancing of the push-pull final because of the cold circuit capacities of the grid of the 959 tube shunting one half of the tank. This has not proved to be troublesome in any way, and neutralization of the final was achieved without any trouble. When receiving, the final tank of the transmitter acts as the tuned input circuit of the r.f. amplifier. Though the tuning of this tank is fixed by the transmitter's frequency, it has proven to be sufficiently broad so as to cause no noticeable loss of sensitivity when tuning across the band. A bias supply of 7½ volts for the modulator is necessary. In order to eliminate the weight and space required if a battery were used for this purpose, 7½ volts was picked up at the junction of two resistors which make up the grid leak of the crystal oscillator.

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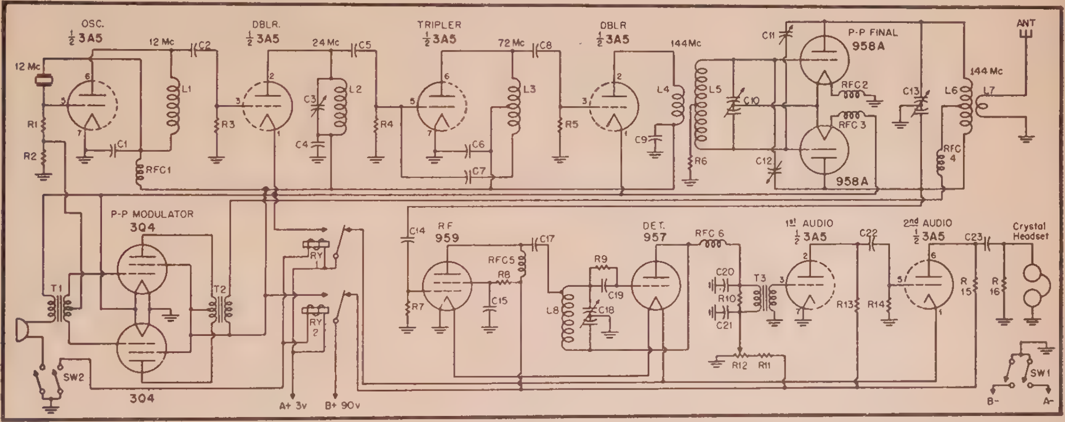
* *2544 E. 16th Street, Oakland 1, Calif*

The Tube Lineup

The crystal oscillator-doubler, tripler-doubler functions are handled by two 3A5 double triode tubes. For maximum output consistent with stability, a regenerative crystal oscillator with a slug-tuned plate was chosen. The first doubler is conventional and merits no comment. Regeneration is employed in the tripler stage. The feedback function is taken care of by the fixed 10-μμf capacitor from the grid of the tripler to the tank on the opposite side of the plate. The output of the tripler is increased several hundred per cent by

(*Continued on page 63*)

This is the way the complete station looks when out of its carrying case, set up on a card table. The rod sticking out the top is the antenna.



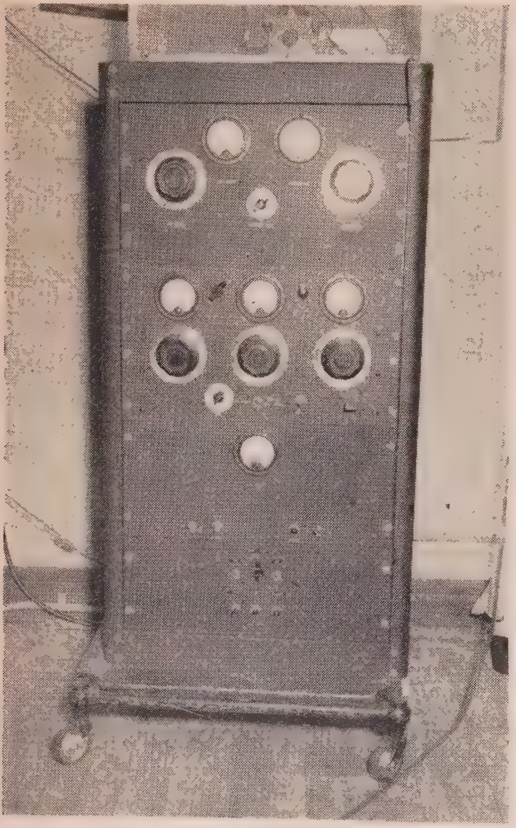
C1, C2—300 μμf.
C3—3-30 μμf trimmer.
C4, C6, C9—680 μμf.
C5, C8, C17, C19—47 μμf.
C7, C14—10 μμf.
C10, C13—3.2-11.02 μμf butterfly (E. F. Johnson Co.).
C11, C12—1.5-4.5 μμf trimmer.
C15—Bypass condensers built into tube socket (National).
C18—2.1-5.27 μμf butterfly (E. F. Johnson Co.).
C20—.002 μf.
C21—.25 μf.
C22, C23—.05 μf.
R1—12K.
R2—2K.
R3-R5, R15—50K.
R6—10K.
R7, R14, R16—1 megohm.
R8, R13—100K.
R9—2 megohms.
R10—30K.
R11—20K.
R12—50K potentiometer.
L1—30 turns #28 d.s.c., ½-inch diameter, slug-tuned (National).
L2—9 turns, ½-inch diameter, ¼-inch long (B & W Mininductor).
L3—9 turns, ⅜-inch dia., ⅝-inch long, slug-tuned.
L4—3 turns, ½-inch dia., ½-inch long (B & W Mininductor).
L5—7 turns #14, ¾-inch long, centertapped. Diameter selected to fit snugly within L4.
L6—5 turns #14, ½-inch dia., ⅝-inch long.
L7—1 turn placed around center of L6—spaghetti insulated.
L8—5 turns #18, ⅜-inch dia., ⅜-inch long, tapped one turn from grid end.
RFC1—2.5-mhy r.f. choke.
RFC2, RFC3—v.h.f. filament chokes.
RFC4-RFC6—v.h.f. chokes.
T1—Microphone transformer, mike to p.p. grids.
T2—Output transformer, p.p. 3Q4 to 10K load.
T3—Midget audio interstage transformer.
Ry1, Ry2—S.p.s.t. relay, 400 ohms, 1.5 volt coil.
Sw1—D.p.s.t. "on-off" slide switch.
Sw2—D.p.s.t. push switch on microphone.

Eliminating TVI in Your Ten-Meter Transmitter

SOLOMON KUPFERMAN, W2GVT*

The elimination of TVI in an existing transmitter is a job which can be readily accomplished if one proceeds in an orderly fashion. Here is how one of the gang licked his TVI completely without going "broke" in the process.

EARLY IN 1948 the owner of a nearby tavern called up to tell me that my ham rig was making funny pictures on his television set and that too many of his customers were taking the pledge because of it. We both agreed that this would never do, so I complied and QSYed from 10 fone to 20 c.w. However, it was not too long before a tenant in the adjoining apartment house tracked me down. So, as you can guess, I was off the air.



Except for the completely-screened penthouse at the top, which houses the antenna coupler, this rig looks similar to thousands of high-power 28-mc phone jobs,

At that time TVI elimination data was scarce and incomplete, but I had the good luck to attend a lecture by Phil Rand. I gleaned enough from the lecture to enable me to construct a Faraday screen-link. The results were excellent, and I was then able to return to 20 c.w. Now that these links are available commercially, the job is considerably simplified.

All went well, but I still had a yen to return to ten. I finally did give it a try, but only after I had built a new final employing all the latest data on TVI reduction. The switch was thrown on 28-mc phone running 250 watts of AM. The tavern across the street (100 feet) showed superimposed lines on Channel 2 that were so slight that only I could tell that the carrier was on the air. There were no visible modulation bars, just extremely slight changes, which were less objectionable than ignition. All other channels were absolutely clear. That was a big step in the right direction—from 90 watts with blacking out of Channels 2, 11 and 13, to 250 watts with the slight effect on Channel 2 that only an experienced ham could recognize.

TV Closes in on Me

In the meantime, a television set was installed in the apartment below mine, exactly nine feet away, and their antenna was set up ten feet from mine. When the carrier was thrown on, the picture tube all but hopped out of its socket. Channels 5 and 7 held out with a good picture, but the audio was in on all channels. Here was a real challenge! Run 250 watts of 28-mc AM phone so the guy nine feet away doesn't "see" or hear you! These questions arose:

1. What channels are affected?
2. How much damage to the picture?
3. If a harmonic, which one or ones?
4. If a parasitic, what frequency?
5. What is the relation of power input to TVI?

A survey chart was made to record the effects of the xmtr on the TVI on this neighbor's set—see Chart I. The final amplifier was not included because a survey on 14 mc showed very little difference with the final on or off. The following four items were the main causes of trouble, and they were attacked one by one:

1. R.f. feedback directly from the transmitter to the a.c. line.
2. "Feedfront" to the a.c. line, from the an-

---

* *701 Prospect Ave., Bronx 55, N. Y.*

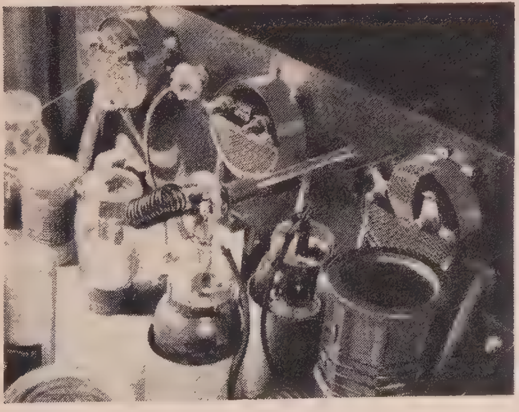
tenna to the exposed wiring in the apartment house.

3. Radiation from the cabinet.
4. Direct radiation from my antenna to the TV antenna, lead-in, and possibly unshielded TV set.

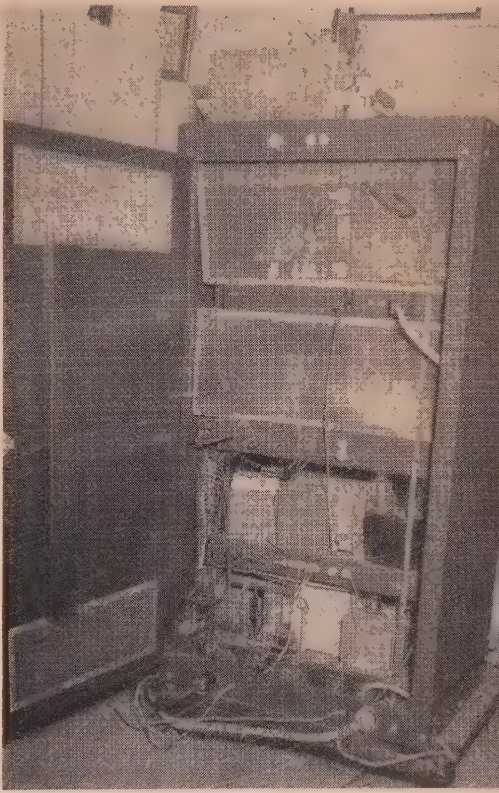
With a chart and a sketch of the layout we have a map to guide us. There is no feeling of groping in the dark or being lost.

To simplify the delousing, the antenna was disconnected from the rig, and a box made of copper screening was built to house the antenna coupler and a dummy load. This step permitted trouble shooting for direct feedback into the a.c. line and r.f. leaks from the metal cabinet. Running 50 watts into a pair of 807s showed 50 microamperes of r.f. in the a.c. line in the transmitter room, and about 25 microamperes at the outlet at the TV set. When the 500-watt final was thrown onto the dummy load, there was a *slight* increase in these readings. This heartening observation was due to the fact that the amplifier and its power supply were built according to all the latest dope published about TVI. The following are a few samples:

1. Copper braided shields on filament lines and filters at the source of supply. (*P. Rand*)
2. Braided shields on d.c. lines using meter mounting screws to hold the supporting straps to clamp the wires to ground.
3. Filtered all lines with pi-wound chokes and 100-ohm composition resistors and by-passed them with 50-μμf silver button condensers (*Fred Gemmill—Feb. 1949 QST*)
4. Shortened all d.c. lines, removed 12 feet of surplus "fancy" wiring.
5. Installed traps in the multiplier stage and driver without butchering the panel or destroying the symmetrical arrangement of the dials and knobs.
6. Placed a tin can over the relays and grounded it.
7. Shielded all meters.



Each of the meters is carefully shielded and bypassed, as can be seen here. The metal shells around the meter cases and the screening across the backs are both necessary if a complete job is to be done.



The shielding panels over the back of the r.f. chasses ar clearly visible in the view. Note also the screening ove the ventilating ports in the back door.

8. Adjusted the rig to operate at minimu drive.
9. Removed all capacity coupling and replace same with link or transformer coupling.

With a field strength meter connected directly t the a.c. line, there was absolutely no indicatio of either the fundamental or the second harmoni When 500 watts (dummy load) was thrown o the f.s.m. indicated 10 microamperes in the a. line, zero on the second harmonic in an outle one room away from the transmitter. In the downstairs apartment there was no indication on an frequency with the f.s.m. coupled directly to th line.

In spite of these good results as far as the a. line was concerned, moving of the a.c. line feeding the transmitter affected the picture on th screen. The cross hatching would appear and disappear just by squeezing the a.c. cord, and th effect was highly critical. Thin-wall tubing an a three-pole receptacle were installed from th wall outlet to within four feet of the transmitte A flexible shielded cord with a three-pole mal plug was connected to the transmitter. This resulted in a slight amount of cross hatching o Channel 2, but at least it was steady and simplified my attack on the problem.

Line No.	Stage	Channel	Harmonic	Input	TEST #1 Unshielded dummy load	TEST #2 Shielded dummy load	TEST #3 Output fed to antenna
1	Osc. & mult.	2	2	10	Mod. trace	Very slight	Strong cross hatching
2	Driver	2	2	50	Picture-like negative	Moderate	Picture blacked out
3	Osc. & mult.	4	None	10	Clear	Clear	Clear
4	Driver	4	None	50	Clear	Clear	Clear
5	Osc. & mult.	5	None	10	Clear	Clear	Clear
6	Driver	5	None	50	Extremely slight	Clear	Clear
7	Osc. & mult.	7	6	10	Extremely slight	Slight	Extremely slight
8	Driver	7	6	50	A little increase	No increase	Clear—using Faraday screen Slight without screen
9	Osc. & mult.	11	7	10	Extremely slight	Slight	Same as Above
10	Driver	11	7	50	A little increase	No increase	Same as Above
11	Osc. & mult.	13	None	10	Clear	Clear	Clear
12	Driver	13	None	50	Extremely slight	Clear	Clear

CHART No. 1

Line #1 shows the second harmonic is quite strong because the dummy load in the shack is radiating. Test #2 shows a leaking cabinet or feedback into the a.c. line. Test #3 further proves the evidence of strong harmonic in the osc. & multiplier stage.

Line #2 the driver stage is generating a strong harmonic or is amplifying the one generated in the multiplier stage. Test #2 further proves the r.f. leak in the cabinet. Test #3 is consistent with the other tests.

Line #3, 4, 5 and 6—there are no harmonics inside strong enough to leak out or have enough db to reach the TV set. Line #6 happened to be slight shock excitation because no parasitics were found.

Line #7 means there exists a very weak harmonic. Test #2 again proves the presence of a radiating cabinet. Test #3 proves losses in the transmission line.

Line #8, driver stage giving weak amplification of harmonic. Test #3—Faraday screen effective.

Lines #9 and 10, though one harmonic away from the previous test, were similar in effect because Channel 11 has a correspondingly weaker signal.

Lines #11 and 12, extremely slight effect because of the very weak signal received on that channel.

I soon became a nuisance to the TV owner due to making so many tests. Several times they were not at home to make tests, so I dragged out my old superregenerative 5-meter job, 1934 vintage, and put it in working condition. It was this harmonic indicator that made me shield the meters. Passing a copper screen over the face of the meters considerably reduced the effect on the superregen.

In handling item 2 of the "main causes of trouble," some interesting things happened. When the antenna was connected to the transmitter the a.c. line that was previously free of r.f. became "loaded." Strangely, *this* type of feed into the a.c. line is easier to handle. An a.c. filter at the TV set itself is very effective. In the large fireproof-constructed apartment buildings, this phenomenon is considerably reduced. The steel girders, wire lath walls, steel reënforced floors and maze of electric conduits embedded in the concrete floors all help to keep out the field of the skywire. It is the old tenements with their bad cable grounds, hundreds of feet of exposed wiring and disconnected gas lines that cause the headaches.

When the exploring loop of the f.s.m. was passed over the meters, all were free of radiation except the final grid meter, which radiated the r.f. in the coil of the movement. The bias was not by-passed properly, resulting in r.f. in the rectified grid current circuit. The meter shields will keep out r.f. fields from tank and grid coils. Any indication on the f.s.m., in spite of shields, shows improper filtering at the source.

The construction of the driver trap is self-explanatory from the photo. The multiplier trap was mounted underneath the chassis and shielded. A 25-μμf condenser and six turns of B&W Mini-inductor was built close to the plate. A flexible shaft is brought up to the front of the panel.

Cabinet Leaks

The superregen showed evidence of a leak when the dummy load was on. When the back door was opened, the harmonic indicator showed a strong increase. With the door closed, there was considerable reduction, but not enough. Swinging the door would give an uneven indication of leak. The paint on the hinges would actually float the whole back door above ground at certain positions. A flexible copper braid was bonded between the door and the sides. This job showed an improvement, but not enough. While fumbling with the lock, the harmonic indicator would show a great reduction in transmitter radiation. The paint on the sides of the cabinet, where the tongue of the lock contacted, made an excellent insulator. The paint was scraped off, and the results were very gratifying. Since this was a cabinet that came knocked-down, every part had to be bonded—even the supporting dolly was radiating. Copper screen panels were placed over ventilation openings. Copper screenings were placed across the back of the r.f. chassis to prevent the stuff from pouring onto the control wires, modulator and a.c. lines. This occurred because the radiation was reflected off the metal door; so, you see, r.f. does go around corners.

After isolating the r.f. stages with copper screen panels, there was no feedback from the exciter–

multiplier–driver unit running 100 watts input. The a.c. lines were free of all r.f. With the 500-watt final going, only 10 microamperes of r.f. was in the lines and no measurable harmonics. No line filter had yet been installed.

A 60-watt lamp was connected to the final grid coil socket and a 100-watt signal fed into the unit. The lamp was very bright, indicating plenty of r.f. around. The stuff was jailed behind the screens so well that the TV set nine feet away did not have an iota of TVI on Channels 2, 11 and 13, and all other channels were clear. Then another chart was made to compare the validity of the interpretation of the first chart and the correctness of the steps taken to delouse the old rig. See Chart No. 2.

Tuning Tank Circuits with Traps

Off-resonance in any tank circuit can produce serious TVI although you can strike a point off resonance where an interfering harmonic is adequately suppressed. These points are so critical as to render them impractical. The amount of grid drive is best judged by the output and the indication on the field strength meter, harmonic chaser superregen, or TV set. Traps are known to be capable of generating serious interference harmonics when improperly adjusted. This fact has frightened many hams away from employing them in their plate circuits. Such an attitude is, of course, erroneous, since incorrectly-adjusted plate tank circuits can ruin the emission of the tube—and yet the boys are not afraid of tank circuits. However, before considering an actual circuit using tank circuits and plate traps, let us review an important fact about harmonic suppression and generation.

The conduction angle in the plate-grid circuit plays an important part in harmonic generation and suppression. For example, the minimum generation for the fourth harmonic occurs when the conduction angle is 135 degrees. Let us consider the tuning of a rig with an oscillator stage, multiplier stage and its plate trap, and a dr
stage with its plate trap. Between the driver
multiplier is a tuned grid circuit. The conduct
angle is dependent on grid current, bias volt
and plate voltage. All three, in turn, are affec
by power line and power supply regulation.
complicate matters further, any one adjustmen
a control can effect one or more of the six.
liance on common sense is your best aid—d
beat your brains out with mathematics, slide ru
half-understood theories or the conflicting opini
of other well-meaning hams. *Install a perman*
harmonic indicator in your station, keep y
eye on it, tune all circuits to resonance and
just traps until your indicator reads minim
If your minimum is still in TVI range, the
lower reading will necessitate still further w
on the rig.

With the cabinet leaks cleaned up and the
fending harmonics suppressed in the exciter-dr
unit, the final was tied in. The final was loaded

(*Continued on page*

					TEST #1	TEST #2	TEST #3
Line No.	Stage	Channel	Harmonic	Input	Unshielded dummy load out of cab.	Dummy load exposed but behind shields in cabinet	Load on antenna
1	Osc. & mult.	2	2	10	Barely seen	Clear	Clear
2	Driver	2	2	50	Picture very bad but not blacked out	Clear	Picture like photo negativ When traps we adjusted pictu cleared with only slight cro hatching visib
3	Osc. & mult.	4	None	10	Clear	Clear	Clear
4	Driver	4	None	50	Clear	Clear	Clear
5	Osc. & mult.	5	None	10	Clear	Clear	Clear
6	Driver	5	None	50	Clear	Clear	Clear
7	Osc. & mult.	7	6	10	Clear	Clear	Clear
8	Driver	7	6	50	Extremely slight	Clear	Clear
9	Osc. & mult.	11	7	10	Clear	Clear	Clear
10	Driver	11	7	50	Extremely slight	Clear	Clear
11	Osc. & mult.	13	None	10	Barely seen	Clear	Clear
12	Driver	13	None	50	Extremely slight increase	Clear	Clear

CHART No. 2

Line #1—Test #1, weak second harmonic; Test #2, cabinet leaks successfully plug
Test #3, Faraday screen effective.
Line #2—Test #1, strong harmonic; Test #2, cabinet leaks plugged; Test #3, n
of second harmonics attenuated, but more needed. Adjustment of traps almost cl
picture.
Lines #3, 4, 5, 6, 7—no harmonics or parasitics.
Line #8—very weak sixth harmonic correctly shielded and attenuated.
Line #9—no harmonics or parasitics.
Line #10—weak seventh harmonic correctly shielded and attenuated.
Lines #11 and 12—slight overload, shield excellent. Transmission lines and ant
systems introduced sufficient losses to bring the output below the overload leve

Correct interpretation is dependent upon a lot of common sense backed by a
background of the current information published about TVI. For example, there
be no cabinet leaks at one power level but leaks at a higher one. This is like a w
point in a pipeline that only shows up at a higher pressure.

Meet the Capacitor

ROBERT L. ROD, W2KVY*

If the relative merits and characteristics of mica, ceramic, and paper capacitors have seemed a bit obscure, you'll find it worthwhile to study this paper by Bob Rod. The construction, characteristics, and uses of capacitors are set forth in detail.

PREVIOUS ARTICLE ON COMPONENTS[1], resistors f various types were discussed in detail to uaint the amateur with some of the varied ufactured types, their features and respective enclature systems. This article will cover the e familiar varieties of mica, ceramic, and er capacitors that are most frequently used ow-voltage circuitry. An attempt has been le to introduce only those pertinent facts ch will aid an experimenter in choosing the possible capacitor for every normal applica-

he physics of a capacitor or condenser—call hat you will—are well known. Any pair of trical conductors having their surfaces rel- ely close together and separated by a di- tric (insulating) material forms a capacitor will store electrical charge when a difference otential is applied across them. When the ductors are in the from of parallel plates, close ther and of large area, the capacity of the acitor is given by the formula:

$$C = 2.25\ \frac{KA}{t}\ 10^{-7}\ \text{microfarads}$$

where:

K = Dielectric Constant
A = Area of one side of either plate, sq. in.
t = Spacing between plates, in.
(1 microfarad = 1×10^{-6} Farads)

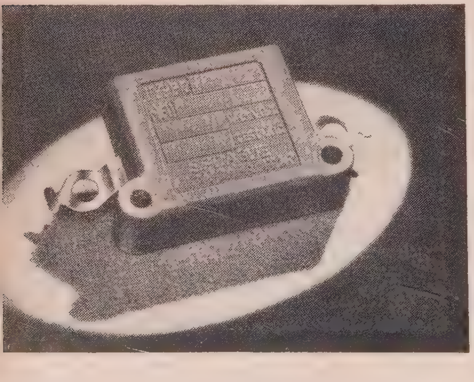
This familar equation shows that the capacity is directly proportional to the area and the dielectric constant and inversely proportional to the spacing between plates. The dielectric constant is defined as the ratio of the capacitance of a capacitor using a specific dielectric material to the capacitance of the same capacitor having a vacuum as the dielectric. Obviously, a capacitor may be increased in capacity either by decreasing the spacing or by increasing the area of the plates or the dielectric constant.

Temperature and Voltage Characteristics

Since space is of paramount importance in most electronic equipment, it would seem at first glance that capacitors might very well have minute spacings between plates to achieve large capacities in small "packages;" however, voltage breakdown possibilities between plates must be considered. To prevent voltage arcing between plates, any dielectric material must of necessity have good "dielectric strength" if small spacings and high capacities are to be achieved.

The actual materials used for dielectrics in practical fixed capacitors vary in dielectric constant from about 7 for mica to several thousand for certain ceramics. For the same physical dimensions, a high dielectric capacitor may have many hundred times the capacity of a mechanically similar mica unit, although the former may *not* maintain a constant capacity over wide ambient temperature changes. The "temperature coefficient of capacitance," or the change in capacity with temperature, generally becomes worse as the dielectric constant K increases.

There are some ceramic dielectrics containing the mineral rutile which exhibit certain useful temperature coefficients. These substances, when mixed in certain proportions, have negative temperature coefficients (capacity varies inversely with the temperature) when K is larger than 21, zero when $K = 21$, and positive coefficients when K is less than 21. A coefficient is usually expressed as a certain number of parts per million parts per ° Centigrade (p/m/° C) in temperature and is preceeded by a sign indicating positive or negative characteristic. Thus, a 100 micromicrofarad capacitor having a temperature coefficient of -220 parts/million/° C will decrease in capacity 0.022 micromicrofarads ($\mu\mu$f) per degree Centigrade increase in temperature, and vice versa. The calculation is done as follows:



molded mica capacitor has been used in r.f. circuits for many years. This is a "transmitting" unit.

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*elpar, Inc., 452 Swann Ave., Alexandria, Va.

od, Robert L., "Meet the Resistor," *CQ*, January,

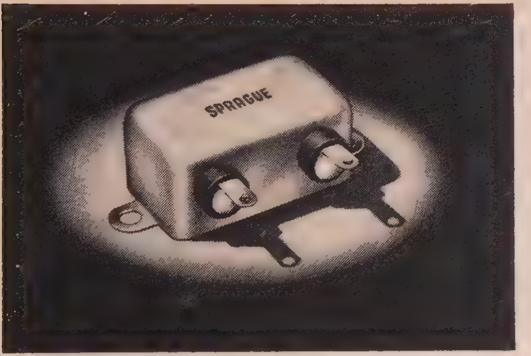
$$\Delta C = \frac{100 \times 10^{-12} \times (-220)}{10^{6}\ ^{\circ}C} = -0.22 \times 10^{-12}\ \text{farads}/^{\circ}C = -0.22\ \mu\mu f/^{\circ}C$$

Such a capacitor might very well be used in some critically tuned circuit where a decrease in capacitance with increasing temperature is needed to balance out an increase in inductance of some associated inductor due to heating of the wire.

Mica finds greatest use as a dielectric material when excellent capacitance stability over wide ranges of temperature is expected. In smaller capacity values, generally those under 200 μμf, zero coefficient ceramic units are capable of performing equally well. Unfortunately, small size zero coefficient ceramic capacitors cannot readily be made having capacity values exceeding several hundred μμf, since they are essentially single layer capacitors, while mica units invariably consist of many layers of alternate conductor plates and mica dielectric sheets.

Power Factor

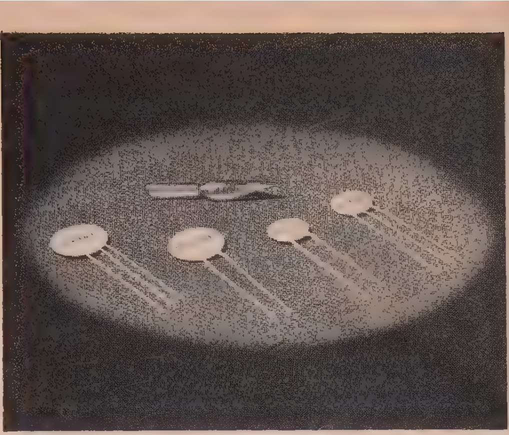
A perfect capacitor would hold a charge infinitely and thus would have zero per cent power factor. That is, the impressed a.c. voltage would lead the current through the capacitor by precisely 90°. In practice, however, this is not quite the case. Dielectrics are never absolutely perfect insulators, and further, some corona and leakage resistance effects are always present in varying degrees depending upon the types. A word of caution is in order concerning high quality capacitors of large capacity values. These items may hold a death-dealing charge for long periods of time, and care must be taken to prevent accidental contact with both plates or terminals unless they are first shorted together through a small current limiting resistor.



The "bathtub" capacitor is simply a paper unit encased in a shielding can.

When using a capacitor in a v.h.f. tuned circuit, it is most desirable to use one having the best possible power factor, i.e. the lowest in per cent, if high *Q* is to be maintained. At 1 megacycle, mica and certain ceramic capacitors have power factors of about 0.02%, a figure which insures excellent circuit performance.

It should be mentioned that power factor worsens with increasing frequency, and that, at higher frequencies, increasing lead and contact resistances of the capacitor also tend to add additional circuit losses.



Ceramic capacitors, with their small size, are becoming increasingly familiar to all of us.

Ordinary mica capacitors are made by piling up alternate sheets of copper foil and mica, after which external leads are connected to the correct internal jumpers between sheets. By plating the sheets or the mica itself with a thin film of pure silver, the over-all resistance of the capacitor may be appreciably reduced with a noticeable gain in high frequency performance. These capacitors are known as "silver micas" and are available at extra cost. Ceramic condensers, on the other hand, are usually made by spraying silver paint on opposite sides of a ceramic dielectric, after which the silver is firmly bonded by firing at high temperatures. Thus, these components have inherently good power factor, excellent mechanical stability, and are also extremely suitable for very high frequency applications.

In the discussion which follows, mica and ceramic capacitors will be treated individually with emphasis on the selection of the correct type for an application. Some notes on paper capacitors will also be introduced.

Mica Capacitors

Mica capacitors find use in circuits where a high order of stability is desired. Depending upon the quality of a particular capacitor, the temperature coefficient of capacitance will vary from about ±200 parts/million/° C. for the average good varieties to 0 to–50 p/m/° C for the best available. The size increases very appreciably as the temperature coefficient requirements are tightened; however, this is common with ceramics as well. Long time capacitance stability of the mica capacitor appreciably betters as the temperature coefficient of capacitance is reduced, since the greater volume used tends to nullify temperature effects.

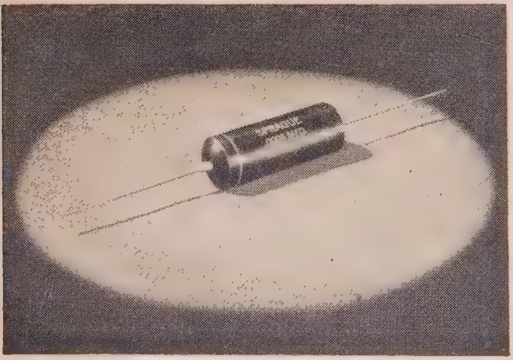
Small micas from 6,200 μμf down are rated at 500 d.c. working volts, while those above have 300-volt ratings. These figures apply only to the small receiving types, since it is possible to obtain micas in larger cases for almost any working voltage desired. The voltage ratings for a.c. depend upon the frequency involved. A particular 1,000 $\mu\mu$f mica capacitor rated at 10,000 volts at 1 kilocycle, for example, has a breakdown voltage of only 178 volts at 10 megacycles, a fact often overlooked.[2]

The minimum value generally available for micas is 5 $\mu\mu$f, while the maximum for small receiving types is 10,000 $\mu\mu$f or 0.01 μf. This wide range is sufficient to meet most r.f. and audio requirements; however, when smaller values are necessary, recourse to ceramics will provide capacity values down to 0.5 $\mu\mu$f. Paper capacitors, not hermetically sealed, are made in values up to 0.25 μf or so, with hermetically sealed papers, high quality oils and electrolytics going very much higher. It must be emphasized that these are only approximate ranges, inasmuch as new developments in capacitors are constantly expanding the scope of each type.

Mica capacitors are therefore recommended whenever the circuit at hand requires a stable, high *Q* (or low-loss), component of comparatively close tolerance. Resonant circuits, time constant charging circuits, and critical coupling applications are typical examples. For non-critical bypass and coupling usage, it is economically more advantageous to utilize the high-*K* ceramics or paper capacitors.

Ceramic Capacitors

Ceramic capacitors may be broken into two general types. There are those having comparatively low dielectric constants with correspondingly low capacities, and there are those having extremely high *K*s.



A molded plastic casing frequently replaces the old paper tube in modern equipment.

The lower-*K* capacitors are ideal for all rigorous circuitry requirements, in particular those requiring temperature compensation. Ten different temperature coefficients of capacitance are usually manufactured in the small values from 0.75 $\mu\mu$f to 300 $\mu\mu$f or so, the number decreasing as the capacity increases. As with mica capacitors, it is difficult to obtain large capacities with zero temperature coefficient in small physical sizes, the maximum Joint-Army-Navy (JAN) zero coefficient component being 360 $\mu\mu$f in a 2″-long tubular case. The coefficients generally standardized upon range from +100 through 0 to −750 p/m/° C, with cost decreasing in the same order. Tolerances for most range from 1 to 20% for values from 27 to 1,600 $\mu\mu$f. Smaller values have slightly looser tolerances due to the difficulties in measuring such minute capacities. Ceramics are available in all values cased in insulated bodies or in the form of uninsulated tubes.

High-*K* capacitors provide the greatest capacities in the smallest space of all presently available receiving type capacitors. Although they suffer from poor temperature characteristics and are available only in comparatively poor tolerances, they are unexcelled for all general coupling and by-pass needs due to their lower cost and their small size. Capacitors of this type are available in the form of dime-size wafer-thin discs in values up to 10,000 $\mu\mu$f. These capacitors are rated at 500 volts or so for d.c. All low-*K* capacitors are rated at 500 volts d.c. Both types must be "de-rated" in the same manner as micas when a.c. operation is contemplated at the higher frequencies. It should be mentioned that the high-*K* varieties are unsuitable for use in resonant circuits, since their stability is unpredictable and since tolerances are so wide by comparison to low-*K* versions that precise frequency control will be impossible.

Paper Capacitors

Paper capacitors are almost universally used when circuit requirements call for 10,000 $\mu\mu$f or more, since large micas are not available. In low cost equipments, they are often used in smaller values, although it appears that high-*K* ceramics will displace them in such usage. These components are made by rolling alternate strips of aluminum foil and specially treated chemically pure paper into tube-like shapes. The foil, when correctly brought out to two terminals, forms the plates which are separated by the dielectric paper. The assembly is packaged into paper or plastic tubes and rectangular cases, both types being very common. Better versions use two or three strips of one to two mil (1 mil = 1/1,000 inch) paper bonded together as the dielectric, while inexpensive varieties depend upon but one layer of one mil material. As is usual in engineering work, a compromise must be made with size and relative security against voltage breakdown versus a smaller, less expensive component.

With one layer of paper dielectric, 200 volts d.c. is the order of working voltage, while two- and three-layer capacitors can be relied upon at higher working voltages. Irrespective of the number of layers, it is absolutely necessary to keep moisture from collecting in the pores of the paper dielectric. Water will destroy these capacitors in a very short time, hence the unusual precautions to keep the innards of these components absolutely dry. Unfortunately, it is almost im-

(*Continued on page 65*)

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[2] Terman, "Radio Engineers' Handbook," p. 126, McGraw Hill, N. Y.

The Minirec—
A Midget Communications Receiver

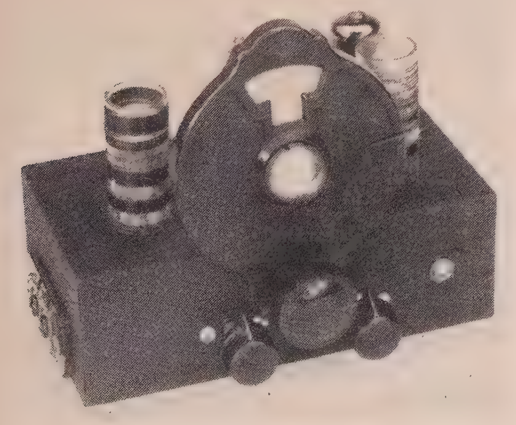
ROGER C. AMUNDSEN, W1HYF*

Here is a 2-tube communications receiver tailored especially for the beginner. Covering the 80- and 40-meter amateur bands without the use of plug-in coils, it is a substantial performer.

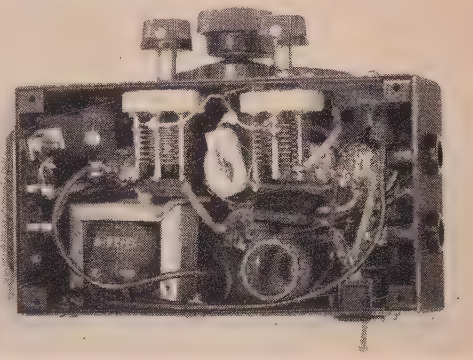
TWO-TUBE SUPERHET RECEIVERS are no novelty to readers of this and other radio publications. However, the "Minirec" is a very compact adaptation of such a circuit. It was designed as a companion unit to the "Minitran," a small two-tube rig built by the writer in 1947.

A 6BE6 miniature tube used as a mixer-oscillator with a 6J6 regenerative second detector and one-stage audio amplifier make it possible to construct this receiver on a 5¼″ × 3″ × 1¾″ chassis, originally a portable meter case.

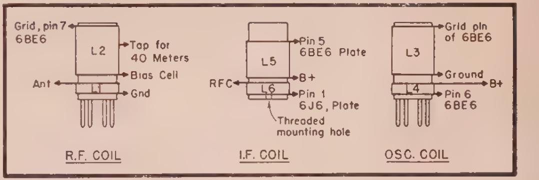
Because only the 80- and 40-meter bands are covered by the Minitran, advantage was taken of the fact that by using an intermediate frequency of approximately 1750 kilocycles only one range of frequencies need be covered by the high frequency oscillator to obtain reception on either band. The oscillator tuning range, therefore, is about 5250 to 5750 kc. Although miniature ¾-inch plug-in coil forms are used in both the oscillator and the mixer tuning circuits, neither coil is ever changed. These plug-in coils are a very handy method of mounting, and make coil adjustment, when the set is first constructed, much easier than if permanent coils were used. To change the mixer circuit from 80 to 40, a tap is brought out to a separate prong on the mixer coil form. One soldered connection, easily accessible, shorts out a portion of this coil for 40 meters. If rapid band changing is deemed advisable, either a switch may be incorporated, if you have the space, or a separate plug-in coil may be used for each band. It was found unnecessary to gang the mixer and oscillator tuning controls. In fact, by keeping the mixer control separate, it may be used as an r.f. gain control.



The antenna and ground terminals can be seen at the left end of the chassis.



It is rather crowded underneath the chassis, but little difficulty should be experienced in getting the Minirec running if care is taken in the wiring.

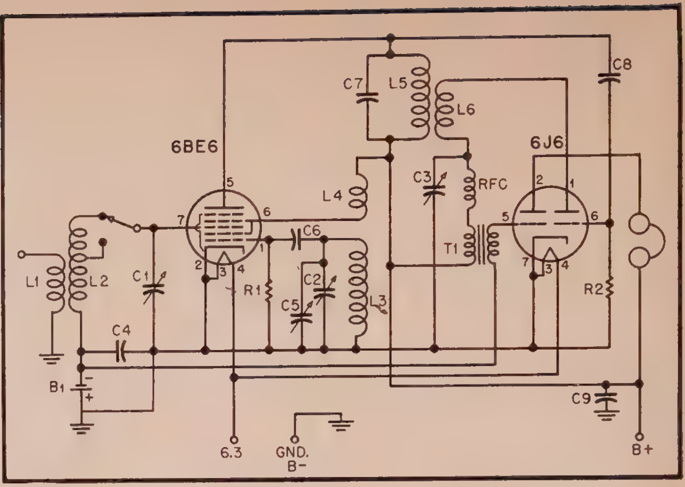


This drawing illustrates, in detail, the structure of the three coil assemblies used in the Minirec. All windings should be in the same direction. The r.f. and oscillator coils are wound on Amphenol 24-6H coil forms, while the i.f. coil is wound on an Amphenol type 24 form. See text and parts list for details.

There is no part of the circuit which is not simple and straightforward, and no attempt to be original, except for the small size, has been made. In either the high frequency oscillator or the regenerative second detector, lack of oscillation generally can be corrected by reversing the connection of one of the coils in either circuit. With only 90 volts of B supply, results are far better than expected, and this receiver makes an ideal companion for the Minitran.

Construction of this unit is made very easy by the use of a ⅝-inch Greenlee socket punch. A

** 311 Housatonic Dr., Devon, Conn.*



C1—50-µµf air trimmer
National PSE-50 or UM-50
Johnson 50J12
Hammarlund MAPC-50
Bud LC-2079
Millen 20050

C2—15-µµf air trimmer
National UM-15
Johnson 15J12
Hammarlund MAPC-15
Bud LC-2076
Millen 20015

C3—50-µµf air trimmer
(same as C1)

C4—.005 µf, mica or ceramic
Cornell-Dubilier 1D5D5
Mallory MC-465
Sangamo C-1250
Sprague 1FM-25
ElMenco CM-35-512
Solar MW.2-25
Aerovox 1467

C5—8-50-µµf ceramic trimmer
Erie 557

C6—100-µµf mica or ceramic
Centralab D-6-101
Aerovox 1468
Solar M0.5-31
ElMenco CM-20-101
Sprague 1FM-31
Sangamo K-1310
Mallory MC-235
Cornell-Dubilier 5W5T1

C7—250-µµf mica or ceramic
Centralab D-6-251
Cornell-Dubilier 5W5T25
Mallory MC-240
Sangamo K1325
Sprague 1FM-325
ElMenco CM-20-241
Solar M0.5-325
Aerovox 1468

C8—100-µµf mica or ceramic
(same as C6)

C9—.01 µf paper or ceramic
Centralab DC-103
Aerovox 484
Solar ST-4-01
American TP6001
Sprague 68P8
Sangamo 300411
Mallory TP421
Cornell-Dubilier DT4S1

R1—68,000 ohms, ½ watt rating
Aerovox 1097
Continental M½
I.R.C. BTS
Ohmite "Little Devil"

R2—1 Megohm, ½ watt rating
(same type nos. as R1)

RFC—2.5 millihenry choke
National R100
Millen 34103
Meissner 19-1994
Miller 640
Bud CH-1212
I.C.A. 1777

T1—Audio interstage transformer
Stancor A52C
U.T.C. R34
S.N.C. 1P331
Thordarson T-20A16
Hallordson A4-703
Merit A2914
Crest 6301

Antenna-Ground Terminal
Jones 2-34
Bud TS1970
I.C.A. 2419

Dial
National type BM

Power connector
Jones P303AB

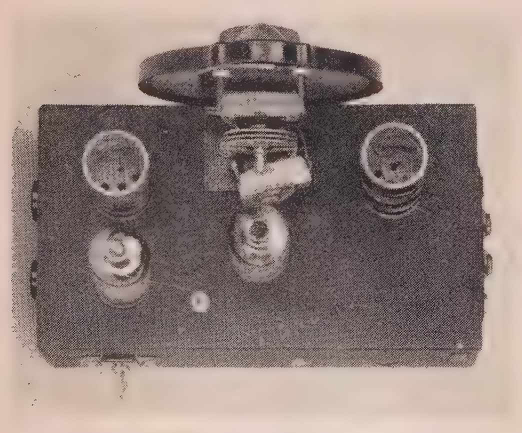
Sockets
2 Amphenol 147-500
2 Amphenol 7856ST

Coil Forms
2 Amphenol 24-6H
1 Amphenol 24 or National PRF-2

Tip Jacks
Johnson 105-520
Eby 49
Telegraph Apparatus 101
I.C.A. 889B
Birnbach 407

Number 30 enamelled wire
Birnbach
Belden
Cornish
Alpha

Chassis
Ensign Industries
Bud CB-629
Par-Metal C4500
Middleton BS591
I.C.A. 1530 or 1560



The top view shows the relative positions of the few parts which appear above the chassis.

bracket 2½″ × 1 3/32″ × 1″ supports C_2 above the chassis and also secures the National BM dial.

The coil winding is not difficult. Drill small holes for the wire by using a drill between your fingers. The heat caused by regular speeds will melt the coil form. L_2 and L_4 are wound to cover an inch of space. These coils can be adjusted until the proper frequencies are covered and may then be cemented in place. The number of turns on L_5 may have to be adjusted slightly to tune the i.f. coil to 1750 kc. This may be done by listening to a communications receiver tuned to 1750 kilocycles. The regeneration control C_3 should be adjusted until a rushing sound is heard on the Minirec. Then tune the communications receiver near 1750 and a signal should be heard from the Minirec. Adjust turns on L_5 until this is at 1750 kilocycles. Now listen to the communications receiver at 5750 kilocycles. With C_2 turned to mini-

(*Continued on page 60*)

1000 Cash Prize "Home Brew" Contest

In about two months the contest deadline will be upon us and our judges will set to work picking the best examples of ham-built radio equipment. Get to work on your entry and help us show the radio industry that the amateur is still in the forefront of technical development.

IE JUNE 30TH DEADLINE for the filing of Initial ntries in *CQ*'s $1000 Cash Prize "Home v" contest is about two months away as you ive this copy of *CQ*, but there is plenty of for you to take part and win one of the cash prizes.

ur judges are going to consider "duplicatibil- as much as anything else. That is: "Can this be duplicated, from the information supd, by an amateur who is an average-to-good nician?" You can see that we won't be doing best for ham radio if our entries require the of machine tools and the like which most of us not have around our workshops.

you have a piece of equipment around the k that you've built yourself, and if it falls in the scope of Rules 1 and 6, get to work on Initial Entry. Our judges are going to award prizes to the ten top, and remember the old "There's always plenty of room at the top."

THE RULES

Entries may be transmitters having an input er of 75 watts or less, communications reers, or test/measuring equipment, such as itors, field-strength meters, etc.

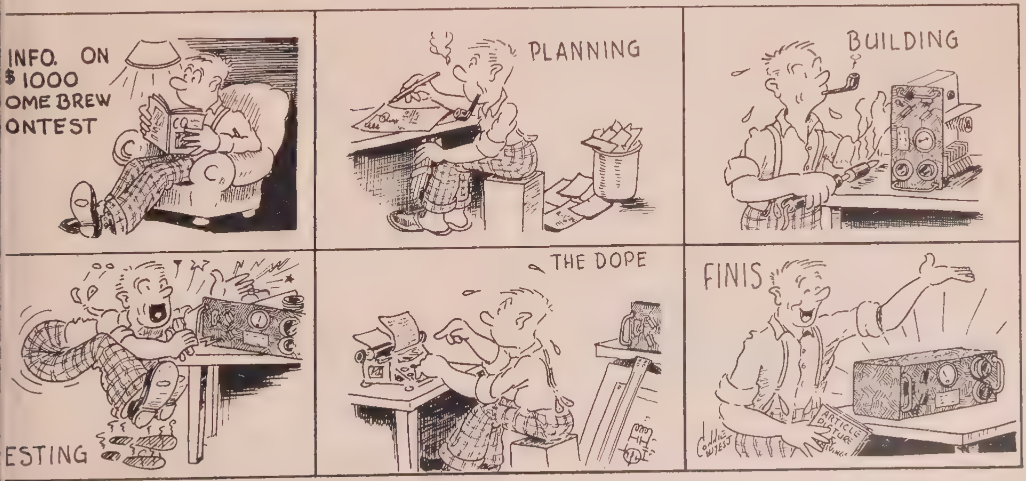
The Initial Entry, a complete written and trated article describing the entered unit, iding circuit diagram and parts list, must be e hands of the judges by June 30, 1950.

3. If the Initial Entry is adjusted to be among the top 20 of the entries received, the judges will request that the unit, itself, be shipped to *CQ* for test and further study. The entrant will make such shipment, prepaid and insured, via express or freight, within ten days after request by the judges.

4. Subsequent to the final judging, which will in no case be later than 45 days after the request for shipment, as detailed in Rule 3, *CQ* will return all entries and equipments to their owners by prepaid and insured shipment—excepting those 10 entries which are adjudged to be the prize winners. The winning units will be returned, by the same means, immediately after the public announcement of the winners in October 1950, *CQ*. The winning *Initial Entries* (see Rule 2) shall become the property of *CQ*.

5. Entries will be judged on the basis of technical merit, quality and accuracy of the written material and circuit diagrams and photographs which constitute the initial entry, and workmanship on the part of the constructor.

6. All components used should be standard, readily-available catalog items of reputable manufacturers. All resistors should be standard ASA values where applicable.



Variable Audio Selectivity With the Surplus FL-8 Filte

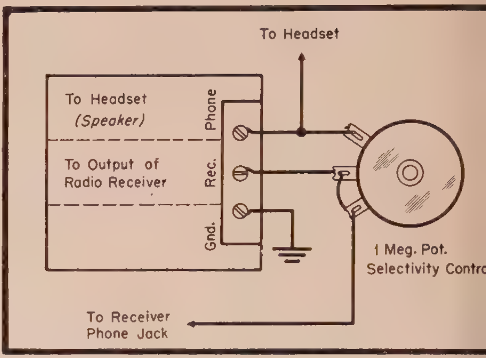
JOHN P. TYSKEWICZ, W1HXU*

If you don't like the sharp peak at 1020 c.p.s. when you cut your FL-8 into the circuit, try this arrangement to broaden it out to any degree you wish.

AFTER ACQUIRING A SURPLUS BC-454 receiver for our standby rig located in studio "B," "B" for bedroom, it soon became apparent the receiver could use a whole lot more selectivity in order to contend with all the heavy QRM on the 75–80 meter band.

As all good surplus hounds know, there are several audio filters on the market, and among them is the FL-8 Radio Range Filter selling for around $1.50. As a radio beacon filter, the unit is probably all right, but when used for ham communication work the darn thing is not so hot, as some already have found out.

When the switch is set for "range," we have a band pass filter having an extremely sharp pass band at 1020 c.p.s. This can be used for c.w. in a pinch, but makes tuning very difficult, and conditions at both ends of the circuit must be stable if we want to let go of the receiver dial. Besides, the filter is so sharp it is a "ringer" like an xtal filter cranked up. Listening to it will eventually break a strong man down. When the filter is switched to "voice," the only significant thing that happens is that we have an audio filter which will attenuate a heterodyne—providing it is exactly 1020 c.p.s. For phone reception the device is almost useless, since most of the QRM a catcall heterodynes are usually everywhere at 1020 cycles.



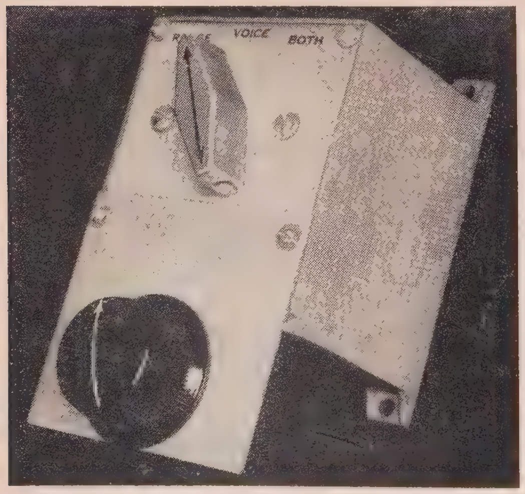
How to connect the potentiometer to the FL-8 termi board.

Now the FL-8 has the makings of a very u ful gadget and can fit any receiver in need some real selectivity. In fact, some may prefer to their present crystal filters for certain kinds reception. The conversion of this surplus item quite painless, and cheap too. The FL-8 can made into a "Variable Bandwidth Filter" sim by hooking a potentiometer across the input a output terminals.

To install the FL-8 in the audio line of the ceiver, it is necessary to remove the four cor screws holding down the switch panel. Und neath is a self-explanatory terminal board. Us shielded wire, run the "hot" wire from middle terminal to the high impendance out circuit in the receiver. The shield braid ties the "GND" terminal. The high impeda phones, or speaker and transformer, if used, c nect to the terminals marked "Phone" a "GND." Now connect a potentiometer to ter nals "REC" and "Phone." A value around .75 1 megohm will do fine. This is the bandwi control, or a "handle" whereby the Q of filter network can be easily and quickly adjust When the variable resistance is set at a minimu the FL-8 is electrically shorted out, and the ceiver audio response and output are norm When at maximum resistance, the audio select ity is maximum.

The FL-8 switch is snapped to "Range" a left there. All of the selectivity control now done with the potentiometer, which will

(*Continued on page*



In this case the selectivity control potentiometer is mounted on a dural plate which is bolted right to the filter.

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* *79 Hamilton St., Hartford 6, Conn.*

The Electrical Design of the 20-Meter Wide-Spaced Rotary

WILLIAM I. ORR, W6SAI*

After last month's beginning, Bill Orr gets down to the "meat" of the beam-construction business—the electrical design. This material should explain a lot of the "witchcraft" hitherto used in beam design.

Designing a beam antenna in the physical sense of the word is a fairly cut and dried problem. The electrical design, however, still remains a subject of much conjecture and dispute. Every "authority" or "handbook" that the inquisitive Johnny Ham investigates will supply him with different, although valid, sets of information regarding element lengths, spacing, tuning methods and the like. Poor Johnny Ham, after seeing the technical authorities of ham radio at loggerheads over the "perfect" set of beam dimensions, will finally give up the struggle and copy Joe Blow's beam down the street, 'cause Joe just got a S9-plus-forty-db report from a ZS. Johnny will build a Chinese copy of the beam, except for changes in element size, spacing, and length, and hope for the best. All will be well until Elmer Fudd, running half of Johnny's power, will blot him out on a VK QSO, and from that moment on poor ol' John will cast a bilious eye at his beam and mumble in his beard and start to think about rebuilding the jigger.

The obvious, though slightly cloudy, answer is that there is no universal set of beam dimensions. Surrounding objects, tubing size, method of mounting and other minute variables all tend to make each beam an entity unto itself, immune to the lengths and results that Joe Blow may get with his beam. The purpose of this article is not to provide a magic set of correct beam dimensions, pre-cut for all, but instead to show a correct and simplified method of adjusting YOUR particular beam to give its best performance.

Most authorities are in agreement on several points about parasitic arrays and these points are a convenient stepping stone to start from:

1. Wide spacing of the elements of a parasitic array tends to raise the transmitting impedance of the beam. This will lower the Q of the beam and tend to decrease the losses. It will also allow a greater frequency coverage of the system.
2. The farther detuned from resonant frequency the parasitic elements the greater the bandwidth of the beam. Also as the parasitics are detuned the gain drops slowly from the optimum value.

How Wide is "Wide Spacing?"

Putting statements *one* and *two* together will give you a pretty fair starting point. First how wide is "wide spacing?" On 14 mc where an electrical wavelength is about 70′ and 0.1 wavelength is 7′, wide spacing means a much different thing than it does on 28 mc, assuming that you don't wish the beam to hang over the neighbor's apple tree. In most cases the spacing will be limited to the available boom length, which in my case is 24′ (two twelve-foot pieces of dural tubing). So, arbitrarily we will set "wide spacing" at a total of 24′, giving 11′ to the reflector and 13′ to the director. If you are lucky enough to get a 36′ boom up in the air, you will be awarded the gold star. However, 24′ will allow the beam impedance to be high enough to allow full coverage of the 14 mc band without a great amount of reactance showing up on the line. Personally, I think a 16′ boom would do *almost* as good a job, but don't quote me. After all, the 14 mc band is only 400 kc wide. The only disadvantage with this "close" spacing is that the beam tuning might start to be a bit tricky. Better stick to a bit longer boom and revel in the painless tuning procedure!

The next thing I did was to collect all the information from *CQ*, *QST*, *Electronics* and the *Kinsey Report* relating to element length of parasitic arrays, regardless of frequency. When I had finished this task I had about twenty different sets of figures. Interpolating these figures to 14.1 mc gave me twenty different answers. I averaged these all out and took the resulting figures down to the radio club (Southern California DX Club) and discussed them with the other members. About

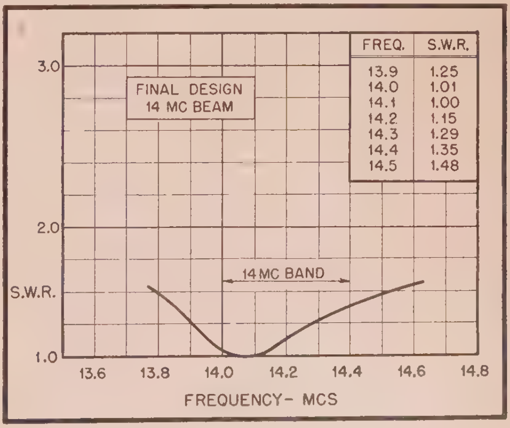

Fig. 1. We're proud of this curve!

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* *555 Crestline Drive, Los Angeles 49, Calif.*

half of the boys thought the dope "looked good," while the other half threw up their hands in horror and stated that I would never work out of Los Angeles county with that beam! The dimensions were:

Director: 31′10″
Antenna: 33′6′
Reflector: 35′2″
Antenna/Director spacing: 13′
Antenna/Reflector spacing: 11′
Estimated impedance: 15 ohms.

The beam was to be fed with RG-57/U twin coax line, and a tuned line segment[1] was to be used for impedance matching.

So up she went!! The feed line was connected to the antenna, and with trembling hands the Micro-match was adjusted and the transmitter turned on. . . . The results of this fiasco are shown in *Fig. 2A*. The S.W.R. was a minimum of 1.4: 1 considerably outside the low end of the band and went to a conservative 50: 1 at 14.5 mc. In addition, the S.W.R. curve was far from symmetrical about the minimum point. Who would ever think that such a simple beam would turn out to be such a clinker? The antenna was used for several days after these tests were made and seemed to work fairly well, except that the loading varied very rapidly with any change in frequency and was the heaviest at the 14.4 mc end of the range. It loaded best when the S.W.R. was the highest! This was an interesting morsel of information to tuck away for future use.

Now, back to *Fig. 2A:* With a bit of thought, it was decided to break this curve down into its components—the frequency runs of the tuned line segment and also of the antenna itself. The frequency run on the antenna was made by removing the feed system, shorting closed the driven element and grid-dipping it. Sure enough, it dipped at 13,925 kc. (*Fig. 2B*). The mystery of the odd-ball results was cleared up when a frequency run was made on the line segment while it was operating into a 15-ohm dummy load. This showed that the segment was operating properly around 13.6 mc and was just starting to go to "pot" at 14.0 mc. (*Fig. 2C*). The sum of these two actions produced the curve of *Fig. 2A*.

The tuned line segment was next attacked to try to bring it into the 14.0 mc band. This was finally given up as a bad job, because when it finally tuned into the band, all the dimensions were radically different from the ones given by formula. Why? Capacity to the boom, perhaps. Obviously, having one variable factor in the antenna was enough to worry about without having to fiddle with a second variable in the matching device! The line segment was therefore jettisoned in favor of the old reliable $\frac{1}{4}$-wave matching transformer or Q-section. Assuming the beam is 15 ohms, we know the RG-57/U is 95 ohms, and from these two figures we can arrive at a Q-section impedance of about 37.7 ohms. That's easy!—two pieces of 75 ohm Amphenol heavy duty transmitting line in parallel. However, this easy solution almost blew up during a telephone conversation with W6DQ, who said, "Well, don't forget that you aren't paralleling two pieces of shielded coaxial line. Because of the coupling between the two parallel lines, the impedance may be 37.7 ohms, and it may be somewhat lower, say around 30 ohms." (What a kill-joy.)

Even so, 30 or 37 ohms, it was still a pretty close match. A line was built, grid-dipped to 14.1 mc and checked on the Micro-match for frequency response. Pretty nice! (*Fig. 3A.*) So once again the antenna system was connected and the Micro-match readings taken, resulting in *Fig. 3B.* Aha! This is more like it. At 13,925 kc the S.W.R. was now down to 1.03: 1, rising fairly evenly on each side, except for a quirk at about 14.3 mc. A quick conference with the kibitzers on the job was held, and we decided that around that frequency the director was starting to resonate, throwing the results out of line. So far so good. The matching transformer was installed as a permanent piece of equipment, and plans were formed to take the beam down and change the lengths of the elements.

Applying the formula f (mc) × element length = K, to the driven element, a K of 467 was derived. Other sources gave values of K from 461 to 475, so I figured my K was as good as theirs was! Substituting 14.1 mc in the formula yielded a driven

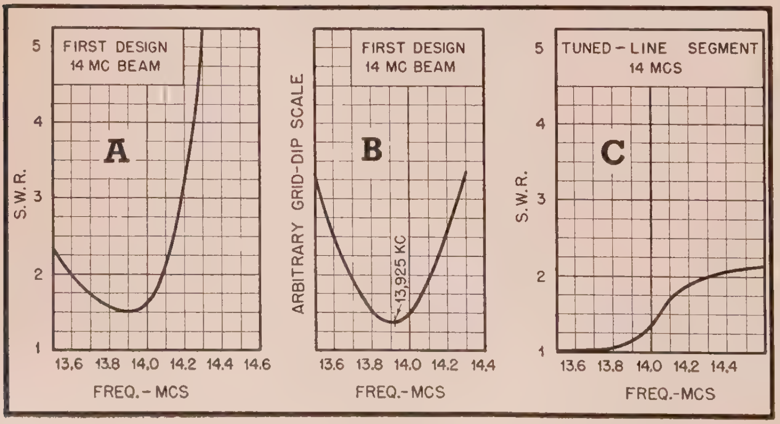

Figure 2—Our tale of woe.

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[1] Gadwa, "A Tuned Line Matching Transformer," *QST,* Jan. 1947.

element length of 33′ for my value of *K*. The beam was duly taken down and the radiator adjusted to that figure. The reflector and director were made 5% longer and shorter, respectively (34′8″ and 31′3″). The beam was then remounted atop the tower and the final Micro-match run was made. (*Fig. 1.*)

Well, that was about it. We had guessed pretty well. At 14,090 kc the S.W.R. was 1: 1; as accurate as the individual Micro-Match we had would read. The worst value of S.W.R. was at 14.4 mc, 1.35: 1, which was still very acceptable. In the c.w. part of the band, which we were most interested in, the S.W.R. was below 1.1: 1.

A curve of transmitter loading vs. frequency was now run, and the same old joker showed up. The greater the S.W.R., the easier it was to load the line. This gives rise to a quick and easy way to check your antenna system: merely hold the coupling constant and tune up the transmitter at the band edges and several intervening points. The point of minimum amplifier loading is the optimum working point of your particular system. If the loading increases gradually each side of a central point in the band, you are in good shape. If the antenna loads best at one end of the band and the loading changes radically throughout the band, you had better look into the match and tuning of your antenna and feed line!

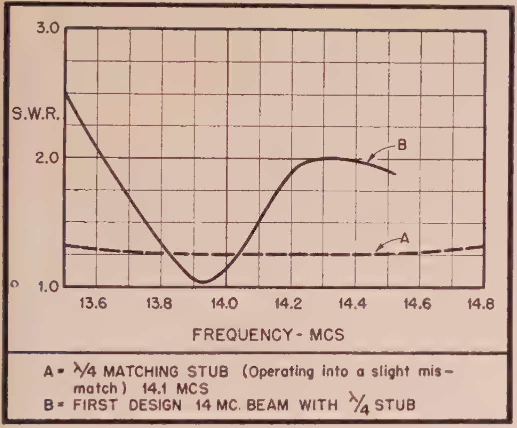


Figure 3

This just about covers the main points in adjusting the antenna. Note that we did not have to cut the parasitic elements or use a field strength meter. All adjustments were made to the driven element and the feedline. It is my strong belief that *if* the driven element is correctly adjusted to provide an efficient load for the particular line used, and the parasitics cut 5% off frequency, the beam will be more closely adjusted than any amount of field-strength adjustment will ever provide.

There are several points to be considered with regard to the adjustment and test of this antenna that should be covered before bringing this paper to a close. These suggestions are valuable because they apply equally well to any type of beam antenna that may be used. They may help to explain some of the "inexplainable" answers that might come up during a routine antenna test.

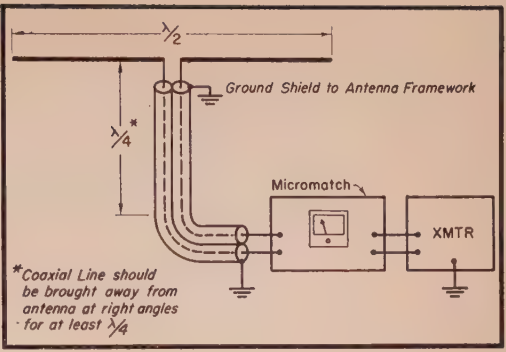

λ/2
Ground Shield to Antenna Framework
λ/4*
Micromatch
XMTR
*Coaxial Line should be brought away from antenna at right angles for at least λ/4

Fig. 4. The best way to use the Micro-match.

Suggestions on the Use of the Micro-match

The Micro-match is a precision instrument; however, it is delicate and high-strung. If treated properly, it will perform wonders; if abused, it will sulk in the corner and deliver all sorts of wierd answers in retribution. For proper results, the line and antenna system must be *balanced* with respect to the Micro-match. This means that the current flowing in each leg of the line must be of the same amplitude and phase. There must be no antenna currents on the line, and there should be no coupling between the body of the line and the antenna. It is difficult to obtain these characteristics in an open-wire line. Capacity to surrounding objects and bends in the line will shift the current distribution. There is always the possibility of coupling between the field of the line and that of the antenna. The use of a low-impedance line that has very close spacing of the wires is highly recommended. Transmitting type 75-ohm ribbon meets these requirements very satisfactorily. A better solution is the use of a shielded, balanced line, such as RG-57/U or RG-22/U. These are twin coaxial lines of 95 ohms impedance. The RG-57/U will handle the legal power limit, while the RG-22/U is good for a hundred watts or so. Twin RG-8/U (104 ohms) may also be used.

Whichever line is used, care must be taken to lead it away from the antenna at right angles to the array in order to keep the antenna effect at a minimum.

When the Micro-match is used with any of these lines, it is important that the case of the Micro-match be left floating. If the case of the instrument is grounded, it will cause a capacity unbalance in the Micro-match which will nullify the results. Keep the Micro-match clear of any strong r.f. fields from the transmitter. Don't place it atop the final tank coil! (*Fig. 4.*) If these precautions are observed, no trouble should be encountered in making standing wave measurements.

For many measurements on stubs and lines, an artificial non-radiating load is needed. The various commercial dummy loads tested are none too satisfactory for accurate measurements. All of those checked had far too much inductance at 14 mc for accurate results. By far the best dummy load for low power levels (100 watts or less) is composed of several 5-watt carbon resistors of various values, connected in series-parallel. Forty and 50-ohm 5-watt carbon resistors seem fairly plentiful in "surplus," having been used as parasitic suppressors in the pulse modulator of the SCR-268 radar set. By juggling values of these resistors, plus a few resistors of higher values, almost any impedance may be set up. The actual value of r.f. impedance of the combinations is very close to the d.c. resistance as measured on an ohmmeter. Be sure when wiring up the resistors to keep all the leads as short as possible.

Bandwidth of Parasitic Arrays

Axiom: The greater the spacing (or detuning) of the parasitic elements in an array, the higher the impedance and the greater usable bandwidth of the array.

Using the beam under discussion (*Fig. 5A*), we have noted that the beam has a bandwidth of approximately 800 kc over which the S.W.R. is less than 1.8:1, and over which the reflector and director act as they should. If this bandwidth is exceeded, the S.W.R. will rise to excessive values, reactance will be reflected into the line, and the gain of the array will drop sharply. What is to be done if the beam is to be used over a band of 1700 kc, such as 28 mc? Well, the 800 kc bandwidth referred to above is at a frequency of 14 mc. When the bandpass is expressed as a percentage of the resonant frequency, it may be seen that the same beam will have a bandwidth of about 1600 kc when it is built for 28 mc. Certain other factors will enter into the picture, such as size of elements, etc., but the beam will perform in excellent fashion over the complete 28-mc band.

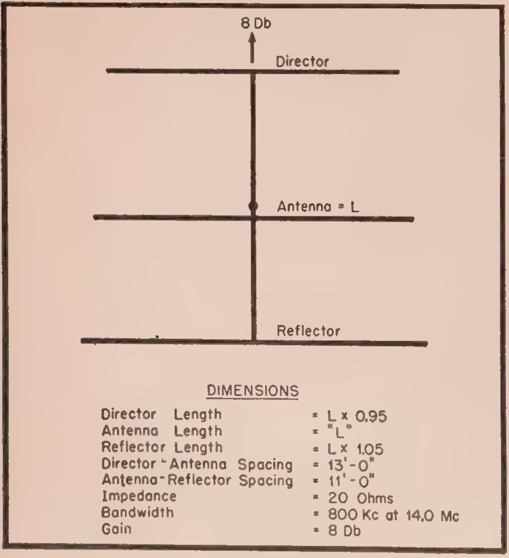

8 Db
Director
Antenna = L
Reflector
DIMENSIONS
Director Length = L x 0.95
Antenna Length = "L"
Reflector Length = L x 1.05
Director-Antenna Spacing = 13'-0"
Antenna-Reflector Spacing = 11'-0"
Impedance = 20 Ohms
Bandwidth = 800 Kc at 14.0 Mc
Gain = 8 Db

Figure 5A

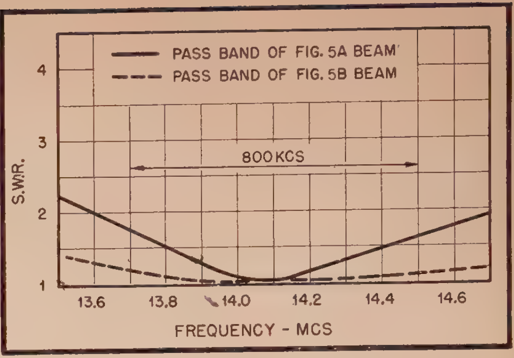


Figure 6

If a greater passband is desired, this may be achieved by raising the impedance of the array. This may be done by detuning the parasitic elements, or by increasing the spacing of the elements, or a combination of both. Another very popular beam is shown in *Fig. 5B*. This beam has a bandpass of over 1 mc at 14 mc with a very low S.W.R. At 28 mc, the bandpass is over 2 mc, thus making it usable on both the 27 and 28 mc bands. The gain of this array is approximately 6 db, whereas the *Fig. 5A* beam has a gain of slightly over 8 db. Contrary to popular opinion, you can't have your cake and eat it. At certain critical frequencies plus or minus the design frequency, the parasitic elements cease to act as "reflectors" and "directors" and become mere hunks of metal distorting the field of the driven element. The broadbanding of the driven element by the use of a cage or folded-dipole will allow the driven element to operate more efficiently over a greater frequency span, but the limiting factor of the practical passband of the beam is determined by the detuning of the elements. In *Fig. 6*, the passbands of the two beams are plotted together. See

(*Continued on page 64*)

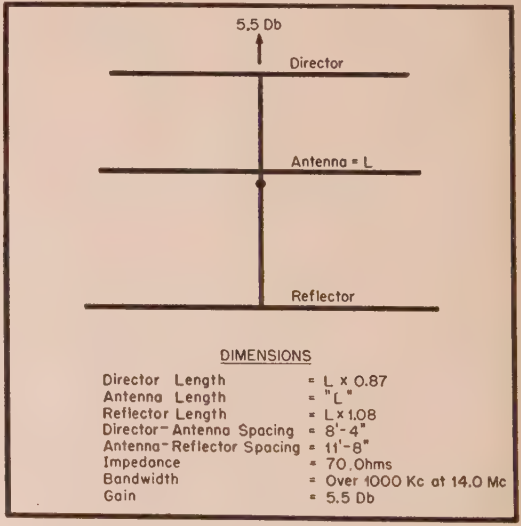
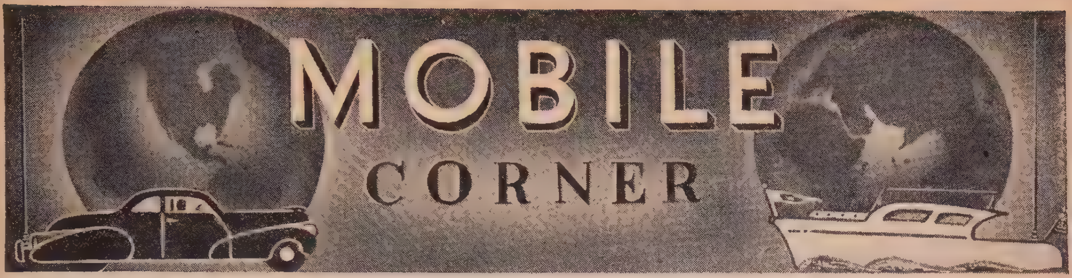

5.5 Db
Director
Antenna = L
Reflector
DIMENSIONS
Director Length = L x 0.87
Antenna Length = "L"
Reflector Length = L x 1.08
Director-Antenna Spacing = 8'-4"
Antenna-Reflector Spacing = 11'-8"
Impedance = 70 Ohms
Bandwidth = Over 1000 Kc at 14.0 Mc
Gain = 5.5 Db

Figure 5B



MOBILE CORNER

Conducted by RALPH V. ANDERSON, W3NL*

THERE ARE NOW OVER 50 MEMBERS in the Maritime Mobile Radio Club. This is an excellent representation, considering the short time the club has been organized, the difficulty of mailing memberships, and the probability that, at any one time, there are less than 150 active Maritime Mobile stations.

Maritime Mobile stations *must* have additional authority to operate in the Panama Canal and adjacent waters. MMs (and others) are prohibited from transmitting while in the Canal Zone and adjacent waters except as provided in Rule 175 of Rules and Regulations governing navigation of the Panama Canal Zone and Adjacent Waters. The basis is the Canal Zone Code, Title 2, Section 9 and Executive Order issued by the President of the United States, on March 18, 1941.

In certain foreign countries, local regulations prevent ordering original subscriptions to foreign magazines. A great many of the MM boys enter subscriptions to *CQ* and other radio magazines for foreign hams upon their return to the U. S. You'd be surprised how many of them do it as a present to the foreign ham.

This column has been advised that when a maritime mobile is within the three-mile limit the station operates under the rules applicable to mobile and portable operation—the maritime mobile is no longer limited to the 10-meter band. All bands open to regular mobile and portable operation can be used, provided, of course, that the "48-hour" notification is given.

All members of the Maritime Club are advised that nominations are open for officers. Send your nominations for Commodore and Vice Commodore to W3NL.

W5AXI (Hutch), Vice Commodore, recently visited ex-DL4PN, W3ICW, W4IOU, and W3NL on his way to visit W5KTL.

Mobile Clubs, Attention!

We shall try to present a brief outline of the activities and status of a mobile club in each issue of this column, perhaps along the lines of the Washington Mobile Radio Club writeup. It would be appreciated if club secretaries would forward descriptions of their club setup to W3NL. This is your column, and, as such, you should feel free to make use of it.

The Washington Mobile Radio Club

The Washington Mobile Radio Club was organized in November of 1947. There are about 35 members at present. Officers are W3IZL, President; W4RBP, Traffic Manager; and W4KYT, Secretary-Treasurer. Officers elected for the coming term are: W3NL, President; W3NPW, Traffic Manager; and W3CDL, Secretary-Treasurer. Meetings are held the first Wednesday of each month at the Printcraft Building (Red Cross Amateur Station). The Traffic Manager schedules all drills and meetings, appoints net control stations and, in general, is the "operating" official of the club. During the past two years the club has had some excellent drills, some "fun" drills only, but mostly on the basis of emergency operation. Three fixed control stations are permanently assigned and stations with phone patches are instantly available. Operating frequencies are 29.520 (main) 29.360, 29.560, and the recently adopted 29.640. All stations now have crystals for the first three, and all will shortly have 29.640. The city is divided into three areas, and three separate problems are sometimes simultaneously handled during an exercise. Several "surprise" exercises have been held with excellent success. There is not much operation on bands other than ten, although there are a few stations on 75 and 20 with quite a number building. Future plans include locating favorable transmission spots throughout the area and setting up a relay plan so that messages from any part of the city, even the most unfavorable location, can be rapidly handled.

Calling Frequency

Our last column suggested the use of 29.640 as a calling frequency for mobiles. In addition to the Chicago and Twin City clubs previously reported, this frequency is in use by St. Louis and Kansas City. The Washington Mobile Radio Club recently voted to adopt the frequency. There is now a sizeable area of the country in which mobile stations are using 29.640 for a calling frequency. It is suggested that all mobile clubs throughout the country seriously consider the adoption of 29.640 as one of its basic frequencies.

(*Continued on page 57*)

** 2509 32nd St., S.E., Washington 20, D. C.*

The M. A. R. S. Page

Here's good news for all MARS members who have been wanting a distinctive QSL card. The MARS Advisory Committee, meeting in the Pentagon Building, Washington, D. C., on February 28, 1950, unanimously approved a proposal to authorize an official seal for the Military Amateur Radio System.

Impression of the seal would be affixed to official communications over the signature of the Chairman and/or membership of the Committee. The seal would also be the basis for membership buttons and emblems, and its reproduction on QSL cards of MARS members would be authorized.

Final approval on the proposal must come from the Chief Signal Officer, USA, and the Director of Communications, USAF. The measure has been forwarded to them by the MARS Advisory Committee.

The measure, as approved by the Committee, calls for a systemwide competition to determine the shape, size and design of the official seal. Lieutenant Colonel L. C. Sheetz, AF4LEK/W4LEK, Committee Chairman, has indicated that as soon as he receives the "go ahead" from the Chief Signal Officer and the Director of Communications, he will immediately appoint a subcommittee and direct it to prepare plans for conducting a contest. Judges for such a contest would be the Chief of MARS—Army, Captain E. L. Nielsen, A4ODI/W4ODI; Chief of MARS—Air Force, Major R. H. Ralls, AF4RB/W4RB; and art assistants at MARS Headquarters.

Captain Nielsen and Major Ralls submitted a joint report on the status of MARS which revealed:

MEMBERSHIP—in MARS has followed a steady pace since the program was activated in November 1948. The present membership is 2,100. MARS Directors at military installations have done an outstanding job to interest new potential MARS members and bring novices to passable code proficiency. This is done by after-working-hours classes and involves a sacrifice of personal time and energy for instructors and students alike.

Colonel Hobart R. Yeager, W2DKP-AF2DKP, Director of Communications and Electronics Headquarters Continental Air Command, uses the facilities at K2AIR-AF2AIR to keep in constant touch with activities at the numbered Air Force under his command.

NETWORKS—follow command channels. Frequencies have been obtained in the two, three and four megacycle range, permitting full scheduling of training and traffic nets in the congested areas. Overseas MARS stations have been assigned a priority on time favorable for operation on MARS long haul frequencies in order to permit contact with state-side MARS stations. Regular schedules are set up for the Far East Command, Pacific Command, Newfoundland, Laborador, Europe, Middle-East and Africa. The Caribbean area contains a lot of hams, but MARS activities are just beginning to open up in Manana-land.

RETIREMENT CREDITS—are awarded reservists with signal communications assignments for controlled net operation on the basis of one point for each three hours of operation in a supervised net. The three hours do not have to be consecutive.

EMERGENCY OPERATION—is a vital part of all MARS training. Net discipline and clear channel operation on MARS frequencies have made MARS stations an invaluable adjunct to existing emergency networks in every comunications emergency since MARS was activated.

Armed Forces Day

Don't forget that the first Armed Forces Day will be observed on May 20th. Details of the Receiving Competition and the QSO Party will be found on page 31 of April *CQ*. Here's the timetable if you've misplaced yours:

ARMED FORCES DAY RECEIVING COMPETITION
20 MAY 1950

	TIME		
NSS Washington	0200 GCT 0400 GCT	(2100 EST) (2300 EST)	122, 4390, 9425, 12630, 17000 kc
NPG San Francisco	0400 GCT	(2300 PST) (2000 PST)	115, 4390, 9255, 12540 kc
WAR Washington	0200 GCT 0400 GCT	(2100 EST) (2300 EST)	3497.5, 6997.5, 14405, 20994, 27994 kc

ARMED FORCES DAY QSO PARTY MAY 20, 1950

TIME	START	END
PST	0900	2100
MST	1000	2200
CST	1100	2300
EST	1200	2400
GCT	1700	0500 (May 21)

Action Near on New Amateur Regs

Designation of May 19th for general oral argument on Docket 9295 sets the stage for presentations by representatives of all amateur groups.

By now it has become pretty generally known that the FCC has designated May 19th as the date for general oral argument on the subject of the proposed new regulations for the amateur service.[1]

The oral argument, which will be on the record, and which will take place before the commissioners themselves, will provide all interested parties with an opportunity to be heard. The *pros* and *cons* of Section 12.0, *Basis and Purpose,* and the proposed Amateur Extra Class license will undoubtedly be brought to the commission's attention by representatives of the several amateur organizations.

Let us hope that, when our representatives go to Washington on that date, all personal prejudices and organizational bias will be left at home, and that all participants will seek only to assist the commission in arriving at the best possible decision for amateur radio. With the next international telecommunications conference (1952) drawing closer each day, there is no place in amateur radio for the continuation of the present division in our ranks.

We can not afford the luxury of dissension in our house!

A representative of *CQ* will be present throughout the entire discussion, and we will, as usual, present you with a complete account of the proceedings in the July issue of *CQ*.

When our representatives gather in Washington for the oral argument, let them remember that the point at issue is not the number of amateurs each group represents, but which group is closest to the set of facts which will strengthen amateur radio both domestically and internationally. Mere numbers does not ensure the right.

The following is the complete text of the commission's order of March 21st:

In the matter of Amendment of Part 12 of the Commission's Rules Governing Amateur Radio Service.—Docket No. 9295

ORDER

At a session of the Federal Communications Commission held at its offices in Washington, D. C., on the 21st day of March, 1950:

The Commission having under consideration its Further Notice of Proposed Rule Making & Notice of Provisional Designation for Oral Argument in the above-captioned matter, adopted November 16, 1949, which set forth certain modified proposals in Docket No. 9295 and which, in
view of a previous request by the America
Radio Relay League, designated "the matter o
the proposal [therein] made for general oral argu
ment unless . . . [it was] clearly apparent fror
the comments filed . . . that general oral argu
ment is not desired by any interested party"; an

IT APPEARING, That the period for com
ments therein expired on January 16, 1950; an

IT FURTHER APPEARING, That the Amer
ican Radio Relay League has reiterated its re
quest for oral argument; and

IT FURTHER APPEARING, That althoug
requests have been filed for formal hearing, suc
a proceeding would not be warranted since, in
sofar as the requests show, the evidence whic
would be adduced at a hearing would not hav
any substantial value in aiding the Commission t
resolve the issues raised by Docket No. 9295 re
lating to the merits of the rules proposed therein
and

IT FURTHER APPEARING, That althoug
a request has been filed that the Commission con
duct a poll of its amateur licensees to determin
the opinion of those licensees regarding the pro
posed rule in Docket No. 9295 which would pro
vide for an Amateur Extra Class of license, th
burden involved in such an undertaking woul
not be commensurate with the benefits to be de
rived therefrom;

IT IS ORDERED:

1. The requests for hearing referred to abov
are denied.
2. The request for a poll of the Commission'
amateur licensees referred to above i
denied.
3. The above-captioned matter is designate
for general oral argument to be held i
Washington, D. C., on May 19, 1950. Al
interested parties who wish to participat
in the General Oral Argument shall notif
the Commission in writing to that effect no
later than May 10, 1950. The notificatio
should refer to Docket No. 9295, should se
forth the specific sections of the propose
rules to which argument will be directed
and should estimate the amount of time re
quired for the presentation. Each notifica
tion should consist of an original and thre
copies.

FEDERAL COMMUNICATION
COMMISSION
T. J. Slowie, Secretar

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[1] *CQ,* January, 1950, page 9 ff.

VHF UHF

Conducted by E. M. BROWN, W2PAU*

THE MONTH OF MARCH ran true to form this year, and came in like a lion. Quite a few antennas which had weathered the winter's worst blows bit the dust under the pounding of the winds of March! But not all of the disturbances in our atmosphere were limited to the surface layer. The upper strata of the ionosphere experienced frequent upheavals, and the result was an interesting period of activity for those six-meter operators who stuck to their posts watching for signs of an ionosphere disturbance. These disturbances usually took the form of an outburst of aurora-reflection activity, followed about 12 hours later by exceptional F-layer DX. Several instances of international DX have been reported during the month just past. Details will follow.

Meanwhile, activity on the 420-mc band has been growing by leaps and bounds. If all the operators who have expressed interest in getting on this band actually do, activity on 420 should rival that on six or two meters before the summer is over. The hopes of these experimenters will be buoyed by a report which we have received from G5BY, describing a QSO with G3EJL, over a distance of 119 miles, fixed-station to fixed-station, on March 5. This looks like some sort of record for DX from home locations on the 420-mc band. If there are any challengers, let's hear from them!

W2BV's Mobile Antenna.

Activity on the two-meter band has been holding up well, considering the fact that most of the 420-mc converts have been drawn from the ranks of the active two-meter operators. Several new two-meter mobile installations are now on the road, and we hear of many plans for bigger and better antennas. The number of "notoriously" poor receivers has been drastically reduced since the "discovery" of the diode noise generator by the rank and file of the two-meter operators. We have heard much more serious talk about the relative merits of the various well-known "front-end" designs than ever before. In short, the band will be well-represented when the summer DX season breaks. DX records will surely fall, this year!

Six Meters in Review

The last issue of *CQ* contained a brief description of the six-meter band openings which occurred late in February. We now have a fairly comprehensive listing of the activity during these openings and will attempt to fill in the gaps of last month's story.

An ionosphere disturbance was predicted by the Central Radio Propagation Laboratory and research workers at Cornell University for February 20th. Thus warned, there were plenty of six-meter operators scanning the bands during the early evening hours. True to predictions, an extensive display of Northern Lights materialized, visible over a wide area. Starting in the early evening, the characteristic aurora noise appeared on the band, and signals, even those from nearby stations, were so severely affected by the characteristic aurora roar that normal modulation was inaudible. The opening was wide-spread, extending across the entire northern border of the country—from Maine to Washington—while scatter effects were observed as far south as Oklahoma by W5NHD. Among the stations active on the band were W1FTX, W1ATP, W1PWW, W2FBA, W2MEU, W2PAU, W7FLQ, W7HEA, W7JPA, W8NBM, W9HGE, W9QUV, W9CGO, W9VZP, W9ZHL, W9RQM, W0OUE, W0JOL, W0CJS, VE3ANY, VE3AET, VE5NG, and many others. W2BV, VE5NG, and Ye Ed checked the 144-mc band for signs of aurora effects, and although there were faint signs of some "fuzz" on DX signals, no purely auroral contacts were reported.

The following morning, things seemed quiet, and despite the fact that several stations were watching the band, the only real DX reported was by HC2OT, who had QSOs with W1HDQ and W9ZHL. Signals were quite weak, and severe and rapid QSB was in evidence. Some hangover of the auroral condition was noted during the evening of the 21st, W2MEU was reported by VE3AET.

Throughout the United States, things seemed to be returning to normal. KH6PP worked ZL2DS for a fairly long period from 0105 to 0215 EST on the 23rd.

An unpredicted recurrence of the aurora on the evening of the 23rd caught many of the gang off base. During the early evening the northeast section of the continent was again affected, and VE1QZ, VE1VL, W1FZ, W1MPO, W1PWW, W2MEU, VE3AET, VE3ANY, W4LVA, W8NBM, W8YLS, W9CJO, W9HGE, W9VZP, W9ZHL, W0TKX,

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* *Send all contributions to E. M. Brown, W2PAU 38 Emerald Ave., Westmont, Collingswood 7, N. J.*

W0CJS, W0BJV, and W0QIN were the most frequently reported. On the 24th, the familiar pattern of F-layer DX following aurora was again demonstrated. After their regular schedule at 7:30 EST on ten meters, W1HDQ and HC2OT made contact on six meters, with weak c.w. signals both ways. Apparently the skip was *over* HC2OT, for when LU9EV called in, his signals were S9 at W1HDQ's location. Thus started a real bang-up opening, which lasted until after noontime, EST, and extended over the entire United States from the east coast to the Rockies. HC2OT worked W1HDQ, W0IPI, W0OLY, W0JOL. LU9EV worked W8CMS, W1HDQ, W0OLY and W0IPI. W0IPI caught HC2OT, LU9EV, LU5BM, LU1BV, LU8BQ. LU8AQ was also reported. It is obvious from these reports that many more QSOs would have resulted if there had been more stations active on the band. Why can't we arrange to have these openings occur only on week-ends or holidays?

During the days following this opening, there was little activity reported in the States, but the South American stations experienced wide-spread openings, usually occurring shortly after sunset.

Few reports are available for the month of March. A sudden, unpredicted ionosphere storm—the one which caused such consternation on the final week-end of the DX contest—struck in the early hours of the 19th. The lower frequency bands were just about completely knocked out for a period of several hours. The early Sunday morning risers were treated to a slight taste of aurora-type contacts, but, in spite of the intensity and duration of the storm, activity was not great. On the following morning, W1HDQ again established contact with HC2OT, but this is the only reported DX we have heard about, to date. On the 21st G5BY commenced tuning the six-meter band at 1630 GMT and heard the signals of ZS1P coming through RST 339. A cross-band QSO with G5BY on 28 mc disclosed the fact that commercial harmonics from Europe had been received in Capetown for over an hour and were fading out when the cross-band QSO was accomplished.

Watch six meters. It is full of surprises!

420-Megacycle DX

On March 5 G5BY was in QSO with G3EJL, 119 miles away, on the two-meter band. Signals were exceptionally good, so G5BY requested G3EJL to put his 436 mc transmitter on the air for a test transmission. To his surprise, Hilton located the signal immediately. The carrier was a good RST 579X, and when voice modulation was used, there was no background noise in the receiver. The signal remained steady for several minutes, and then started to fade. Hilton then reported back on 145 mc, and asked G3EJL to listen on 435. After a five-minute call, G3EJL was heard having trouble getting on the air on 436 mc. It seems that his 832 tripler had given up under the strain! He then switched back to 145 mc, and reported G5BY's 435 mc signals as a good S7 with some QSB.

Both stations were crystal-controlled. G5BY used a pair of 8012s as triplers with 25 watts input, and claims a measured efficiency of about 30%. He drives them with a two-meter exciter that is capable of putting out about 80 watts. G3EJL, as noted above, used an 832 tripler to feed a 13-element horizontally polarized Yagi, via a coaxial cable. During this test G5BY was using a 420-mc version of the 24-element W2NLY antenna, fed with an open-wire line of 330 ohms characteristic impedance made of #12 wire. Separate lines are run from the receiver and the transmitter to a change-o
relay located at the base of the antenna. Both
tions are using communications receivers as the fi
i.f. section, and both use crystal mixers as the 4
mc input circuit. G5BY uses a 6J6 as an oscilla
apparently using 3rd-harmonic injection. G3E
uses a 955 as a fundamental-frequency oscillato
the 430-mc region.

The weather at the time of this QSO was typ
"v.h.f. DX weather"—unseasonably warm, with
banks rolling in from the sea. The 435-mc sig
seemed to fade roughly in proportion to the t
meter signals.

G3EJL operates under conditions far from id
—from an apartment building in residential Sou
ampton. This QSO should give the 420-mc work
on this side of the Atlantic something to shoot f
It may well provoke another wave of controversy
the subject of transmitter techniques. This is
example of what can be done with low-powe
crystal-controlled transmitters and communicati
type receivers on both ends of the path. Could
same work have been done with modulated osci
tors and converted radar receivers? Let's have y
ideas. . . .

VP9 on Two Meters?

We hear from VE1QZ that he is planning to v
Bermuda for several weeks during the early summ

(*Continued on page*

The antenna farm at W6UQG, showing his stacked
and ten-meter arrays atop the 40-foot tower, an
vertically-polarized 3-element 2-meter beam which
a coaxial-skirt dipole. The A-frame in the back lot s
ports the far end of a long wire for the lower ba

DX AND OVERSEAS NEWS

Conducted by HERB BECKER, W6QD*

AZ CERTIFICATES are being awarded this month to the following, and we would like to extend r sincere congratulations to these eight DXers:

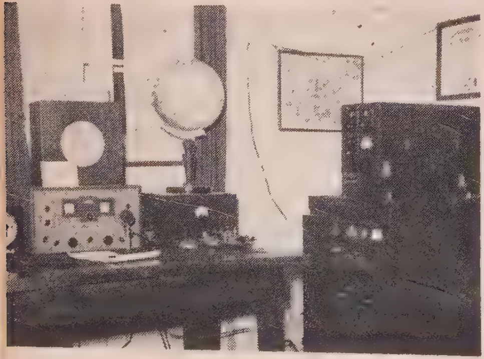
1	G6QB	L. H. Thomas	40–190
2	W6ONZ	Robert J. Kovak	40–139
3	G3YF	Frank Hooson	40–152
4	VK6KW	Ron W. S. Hugo	40–177
5	WØELA	Clyde F. Norton	40–176
6	ZS6DW	William F. Meyer	40–162
7	I1KN	Dr. Fortunato Grossi	40–177
3	KH6PY	Charles H. Jackson	40–143

I am sure these calls are all familiar to you. 6DW has had quite a time rounding up the oper cards for certain zones, but he finally made A few of these fellows had AC4RF as being rked while operating portable, and with the tus of AC4RF being clarified, it cinches their 40 nes. Since KH6PY moved from San Diego a uple of years ago, he has done remarkably well getting all forty of them. . . . Tommy Thomas, QB, is DX Editor of "Shortwave Magazine," d finally took time out to send us his cards. . . . e going, all of you, and let's hear from you often.

4RF, Eastern Tibet

In the March issue, I touched on the subject of 4RF possibly not being in Tibet or Zone 23. ile Bob Ford was operating portable, I know raised the question in a lot of your minds as to ether or not he was actually in Tibet. I am glad say that after going to our usual reliable sources international geography, we can tell you that the present de facto boundary of Tibet and Zone 23 includes the town of Chiamdo (or Chamdo). On most maps, this town actually shows up in Western China, and this is what has created a doubt in some of your minds, as well as ours. This portion of what the older maps show as Western China is actually included within the de facto boundary of Tibet, and this area is governed from Lhasa. Are you happy? We are!

I think a few words might be in order regarding the status of SV7AA on the island of Khios in the Aegean group, as well as the Kermadecs. Both of these are up for consideration as official countries, and many of you probably would like to know why the heck they haven't been added. The reason is that should the RSGB, ARRL, and *CQ* decide to put them on the Official List of countries, it would then set a precedent which would possibly allow every dot on the globe to become what we now call a "country." Until the present time, the yardstick which we use has worked out fairly satisfactorily. There is, of course, more to it than I have put in print here, but, basically, this is the reason why neither has been added. Three-way correspondence on subjects like this takes a little time, but rest assured that all three are working toward a solution, and I hope it won't take too long. In the meantime, have a little faith in us, fellows.



The BC-610 and HQ-129X at HB9P.

Galapagos Expedition, HC8GRC

Just as the April issue hit the printers, we received another letter from HC2JR on the Galapagos Expedition. Unfortunately, we couldn't get the following bit of important news in April, so here it is:

"The Galapagos Expedition, HC8GRC, is going to QSL all contacts through the bureau. All cards should be addressed to: HC8GRC, Guayaquil Radio Club, Box 684, Guayaquil, Ecuador. John Reed, their president, tells me this expedition is being financed out of the pockets of the hams who are going out to the Galapagos to operate. Naturally, the sending out of QSLs, as well as the expedition itself, is somewhat of a financial burden, and they have decided to have a "Special QSL Service." This service will mean that if you send one dollar ($1.00) to the above QTH, the club will send a special QSL card directly to your home address by airmail. This card will also bear an imprint to the effect that the station to which it is sent is a contributing member of the expedition.

HC2JR wanted to make it clear that they were definitely not asking for contributions. My personal reaction is this. Naturally, it doesn't cost one dollar to send a QSL card, and if this was the only method by which you could obtain one from them,

---

end all contributions to Herb Becker, 1406 uth Grand Ave., Los Angeles 15, Calif.

W. A. Z. HONOR ROLL

CW & PHONE

WAZ

W1FH	234
W6VFR	231
W2BXA	227
W6EBG	225
W3BES	224
W6ENV	224
W6GRL	224
W6MEK	222
W6ADP	222
W3GHD	221
W0YXO	220
W8BHW	218
W6PFD	218
W3LOE	217
G6ZO	217
G2PL	216
W6SN	214
W6ITA	214
W4AIT	213
VK3BZ	212
W2PEO	212
W3EVW	211
W6SAI	210
W6FSJ	210
W6TT	209
W2AQW	208
W8HGW	208
W6MX	208
W6AM	207
VE7ZM	206
W4BPD	206
W9VW	206
ZL2GX	206
W6SYG	206
ZL1HY	206
W7GUI	205
W6NNV	205
W6MJB	205
LU6DJX	205
W6DI	204
W6PKO	204
W4CYU	203
VE7HC	203
W6RM	202
W6SC	202
W6OMC	202
W7AMX	201
PY1DH	201
W6DZZ	201
W9NDA	201
VE4RO	201
W6OEG	201
W6MVQ	200
W9KOK	200
W6PQT	200
VK2ACX	199
W2IOP	197
PY1AJ	196
W6WB	196
G2FSR	196
G4CP	195
W5KC	195
CE3AG	194
KH6IJ	194
W6GAL	193
W6AVM	192
W6HX	192
W6ZCY	191
ZS2X	191
VK2DI	191
W6RW	190
G6QB	190
VK3JE	189
W6RBQ	188
W0NTA	188
W6DLY	188
W6AMA	186
W2CZO	185
W6PB	185
W6TI	185
W6SA	184
W6UCX	184
W6EFM	184
W6GDJ	184
G3ATU	183
W6AOA	181
W6KRI	181
W6EPZ	180
W6IFW	180
W7DL	177
W0UOX	177
I1KN	177
VK6KW	177
W0ELA	176
CX1FY	176
W6IBD	176
W1AB	175
G3DO	175
W8SDR	175
W6WKU	174
W6CIS	174
W6TS	174
W7FZA	174
W6PCS	174
W6TZD	173
W6UZX	173
G5YV	172
OK1LM	172
W6SRF	171
LA7Y	171
W0SQO	171
PY1AHL	171
W6KUT	171
W6BAM	170
W6PZ	169
VK4HR	169
KH6BA	169
W5AFX	169
ON4JW	169
W6JZP	168
W6RLN	168
W6ANN	167
W6UHA	167
VK3CN	167
W6DUC	166
KH6MI	166
W6CEM	166
VE7GI	165
W6EAK	163
W6YZU	163
VE7VO	162
OK1HI	162
W6PH	162
ZS6DW	162
W6PDB	161
W6PUY	160
W7ENW	160
W6LN	160
W6VBM	159
I1IR	158
W6WWQ	158
W6CYI	157
W7BD	157
W0OUH	157
W7BE	156
W6BAX	155
G3AAM	154
W6KEV	153
W6BUD	153
W6BPD	152
G3YF	152
VK2QL	151
OK1SV	151
W6LRU	150
W6LEE	150
W6FHE	150
W6EYR	150
W6LDD	150
OK1FF	148
OK1CX	147
W7DXZ	146
W6AYZ	146
VE6GD	146
W6LS	146
W9NRB	145
W6MUC	145
W6QD	145
W6MUC	145
W6LER	145
ON4TA	144
G3BI	144
JA2KG	143
KH6PY	143
W6ONZ	139
W6ID	138
ZC1CL	138
W6RLQ	136
OK1WX	135
G3AZ	133
W6TEU	133
W6RDR	133
W6OBD	131
W6MHB	130
W7ASG	129
W7GBW	127
G8IP	127
G5BJ	126
PK6HA	124
G5VU	124
W6NRQ	123
W6MLY	123
W6BIL	119
ZS6CT	113
KG6AL	103
VK6SA	103
W7KWA	98

39 Zones

W3KT	214
W9ANT	212
W0NUC	211
W3IYE	209
W2HHF	208
W3JTC	208
W1JYH	208
W2NSZ	208
W1ENE	205
W1BIH	204
F8BS	204
W9RBI	204
W8NBK	203
W9IU	201
W2HZY	200
W3EPV	197
W5ASG	196
W3OCU	196
W2GWE	195
VE3QD	195
W4GG	193
W2CWE	192
W3JNN	191
W3DPA	191
W2AGO	191
W1AWX	191
W9LNM	186
W0EYR	186
W8RDZ	184
W3DKT	184
W3DRD	183
W4INL	183
W1ZL	183
W8SYC	182
W9MXX	182
W1DQH	181
VO6EP	179
W2EMW	179
WODU	178
KP4KD	177
W2WZ	174
W8CVU	172
W3JKO	171
W9LM	170
VE3IJ	170
W6CTL	169
W1NMP	169
W9VND	169
PY2AC	168
W2CYS	167
OK1VW	167
W8LEC	166
W2CNT	166
W4DKA	165
W4LVV	164
W7PGS	164
F9BO	163
W9FKC	163
W3KDP	162
W4BRB	162
W2RGV	161
G5DQ	160
W6EHV	159
W2BJ	159
WOGKS	158
W4OM	158
W4VE	158
W0AIW	157
I1AY	157
W6JK	157
G8KP	156
W9YNB	155
I1AIV	154
W9TQL	154
G6QR	152
W2RDK	152
G2AJ	151
W4RBQ	151
W6BZE	149
W4AZK	149
W8VLK	149
SM5WI	148
DL2KW	147
G2WW	147
W2COK	146
W2GUR	146
W2MEL	145
KH6VP	145
VE3AAZ	145
TF3EA	142
W8WWU	142
GM3CSM	141
W9DUY	140
G6BQ	140
OK1AW	140
G3FJ	139
W6LGD	139
W9ABA	138
DL1FK	136
OE1CD	134
G2BD	132
G5RV	132
W7ETK	132
VK4RC	131
W6TE	131
CR9AG	131
ZS2CR	131
W5CPI	130
W6ATO	130
DL1DA	125
VR5PL	124
W6MI	124
VE7KC	124
W6NTR	123
G3AAK	122
G8RL	120
G4WM	120
W7BTH	120
W6MUF	118
DL3DU	118
G6BS	117
W6NRZ	117
KL7UM	117
W9NZZ	117
G3QD	116
ZS2EC	116
W7HXG	115
G3TK	114
W6JWL	114
W6EYC	114
KL7GG	114
W6VAT	110
W7GXA	105
W6LEV	103
W6WJX	101
W7LEE	91

38 Zones

W2HMJ	185
W2PUD	180
CM2SW	174
W8KPL	166
W8FJN	160
W2RGV	156
W2GVZ	153
W3LVJ	145
W8ZMC	143
ZS2AT	143
W9FKH	135
VE3ACS	134
W4FPK	131
G8IL	131
G4CI	130
W2PQJ	130
W3ZN	129
G6LX	126
W9MZP	126
FE8AB	126
GW3AX	123
W9TB	122
GW4CX	120
W0FET	118
W6ETJ	114
W7EYS	107
KL7PJ	107
G3ZI	107
W6CAE	98
C1CH	84

37 Zones

W1KFV	168
W2ZA	160
W3WU	148
W4IWO	146
GM2UU	142
W8EYE	142
W4ML	138
W3FYS	136
W2AYJ	133
W0AZT	129
W4DIA	129
W1APA	118
VE1EA	116
W0FWW	108

36 Zones

HC2JR	156
W4HA	149
W9WCE	136
OA4AK	128
W3AYS	124
W2WC	124
W9LI	124
W0RBA	122
SV1RX	119
MD5AK	118
W2BF	115
G2CNN	114
VE5JV	113
G2AKQ	112
4X4BX	112
W5CD	108
W2JA	102
W6ETJ	102
G2AO	100
W5BK	99
G6WX	95
OH3OE	85
GM2AAT	75

35 Zones

W1BFT	141
W2OST	139
W4DHZ	132
W9CKP	124
W6ZZ	120
VE1PQ	120
W9RQM	119
CO6AJ	119
W8AVB	119
W9FNR	112
W9DGA	108
KZ5IP	108
FE8AB	107
W2HAZ	107
W9HUZ	102
W0GBJ	101
W0FWW	99
ZL1QW	99
VE8AS	86
KL7CZ	66

34 Zones

W8NSS	133
W4IYT	127
W1MRP	113
G6QX	110
W8JM	102
OE1FF	99
W9WEN	83
VE8AS	82
W8PCS	80

33 Zones

W4QN	110
G6QX	109
W2SEI	100
W8QUS	85
G2VBN	80

PHONE ONLY

39 Zones

W6DI	192
W6VFR	165
W7HTB	161
VQ4ERR	160
HB9DS	145
VE7ZM	145

38 Zones

W2BXA	174
W4CYU	173
W9NDA	157
W1HKK	153
W6KQY	145

37 Zones

XE1AC	182
W1JCX	170
W3LTU	169
W9RBI	166
W8REU	163
G2PL	154
W6WNH	153
G3DO	153
W7MBX	153
W6PXH	152
W8BF	146
F9BO	137
W3JNN	136
W6TT	135
G6LX	124
F8VC	124
G2AJ	121
W6AM	111
DL1FK	111
W7MBU	97

36 Zones

W1NWO	166
W1MCW	164
VK3BZ	155
PK4DA	150
W4ESP	144
W9HB	139
W9BZB	136
GM2UU	135
W6POB	130
W4INL	129
W1FJN	128
G6BW	127
W8AUP	126
W9HP	124
W0HX	118
VE3BNQ	115
G5YV	106
G6WX	105
W3DHM	96
W6SA	92
F8DC	87

35 Zones

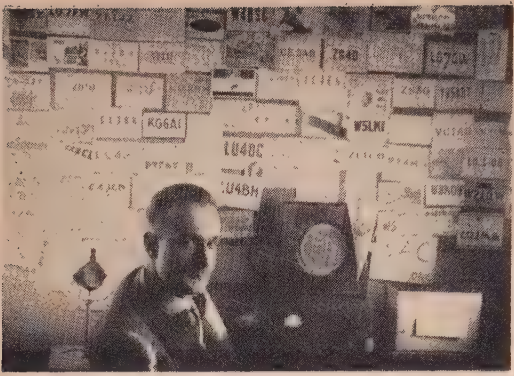
HC2JR	148
W4HA	140
W6PCK	135
W0EYR	131
W2RGV	128
W6CHV	128
W0PRZ	124
G8QX	123
W8ZMC	122
W2GHV	121
CE3AB	121
W9CKP	117
W0PUE	117
G3FU	115
W0PUE	114
W5LWV	108
W4OM	106
W3PA	105

34 Zones

W9RNX	132
W5KC	125
W6UZX	120
W8BIQ	120
W4LZM	117
W0ANF	115
W4LZM	114
W1BPH	105
W8UIG	100
W4IWO	99
W8QBF	92

33 Zones

W5ASG	134
W9MIR	123
W9WCE	119
W5ALA	119
W2ZVS	116
W9BVX	116
W2ZW	115
W8BFQ	114
W8NSS	112
VE3BQP	108
W0ANE	106
W2PQJ	100



I1VS, the wall paper and his S-20R.

we would be against it. However, John, being the guy that he is, assures me that everyone who works the expedition will get a card, but knowing that some of the boys are a little more antsy to receive their QSL cards than others, they are offering this special QSL service.

If some of you fellows didn't hear HC8GRC around the first part of April, it was because there was a slight change in plans by the Minister of Defense regarding the ship's leaving for the Galapagos.

ZS2AT has apparently had to QRT for one reason or another and is not exactly sure when he will be able to get back on the air. He says it might be as much as a year before he will be in there again. . . . Let's hope not, as Art left off with 38Z and was hot after Zones 2 and 19.

W3OCU is happy after working AC4RF for his 40th Zone. Hal can also work other stuff such as VQ5ALT, EA9AI, and HS1SS. . . . DL1DA is working all kinds of DX these days, but, alas, no Zone 23. He wants to know if we can issue a "W39Z" certificate.

CR5AM Slightly QRT

A couple of eyebrows were lifted when W6AM worked CR5AM last month. However, these same eyebrows were restored to their natural position when Don received a QSL card from CR5AM, as well as a photo which you will find in the column. CR5AM, in his letter to Don, said that he was now off the air because his "807 lampe spoiled." W6AM says he guesses that if anyone wishes to QSO CR5AM, he will have to send him a new "lampe." . . . In the April issue, we listed the QTH of CR5AM as we received it from Don, and everything was O.K. except that the town was omitted. The full QTH will be found at the end of the column.

Speaking of eyebrows being raised, they are now assuming this position regarding VQ9ON. The reason is that none of the gang can get him to point up correctly on their super beams. This one is so new that it is hard to tell whether the eyebrows will be lowered or not. Of course, by the time you read this, it might be old stuff.

W6LS tells us that ZE3JJ is ex-G3CHP. . . . I think I mentioned this before, but anyway, I am telling you again that KX6BA is W6PZ. Sure, you can QSL to PZ's home QTH. . . . It looks as though OK1AW wastes no time in adding to both his family and his countries. They have a new daughter, Jana, born January 22, this being their second YL Op. Oh, yes, the new countries are VS8CE and ZS3Q.

W2NSZ worked VK1RD on Macquarie, 14,070 c.w. . . . In a letter from PJ5CW to W8CED, it looks as though the PJs will soon be licensed.

W2IOP says he believes we never did credit him with EA6AF. Why should we? He isn't Editor anymore . . . t' heck with him!!

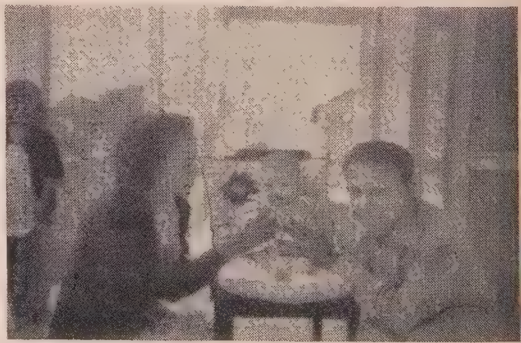
Quite a clambake was had the latter part of January when the Northern California and Southern California DX Clubs met in Fresno. You fellows know as well as I do what the topic of conversation was. . . . W6LDD, Prexy of the Northern Club, and W6SAI, the outgoing Prexy of the Southern Club, shook hands over a challenge on the ARRL DX Contest. A suitable two-gallon cup has been put up as a perpetual trophy. . . . By the way, the new Southern California DX Club president is W6GAL. Both of the clubs elect new head men every six months.

W9ABA thinks the VR1C he worked is NG on account of having his card returned. . . . W7FS wants to know who UZIZQ is. He is wondering if the UZ stands for "Udder Zone." W7FS mumbled something about Mae West, and then went on telling me that he heard a fist, probably belonging to British Cable and Wireless, on 7 mc signing ZC2EL. This station is alleged to be on Keeling-Cocos.

Much like DL1DA, we see that DL1FK is having a hard job latching on to Zone 23. . . . W3DLI worked F9RU on the low end of 40, this QSO being the first one for F9RU. 3DLI also wants it known that VK5XK is hot after Delaware and Maryland for WAS. . . . KP4KD has moved back into town and is using a half wave 80-meter Zepp. This was good enough to grab LU7AZ on 3560 kc.

W2CSO worked his last Zone by logging AC4NC. This happened at 7:38 A.M. E.S.T., and AC4NC was on 14,124. . . . Just in case some of you didn't read it in April, FB8AX is in Adelie, which is none other than Antarctica. W1FH says he (FB8AX) operates on two frequencies—14,040 and 14,080, but, of course, not at the same time. Oh, yes, there are two operators there, Maurice and Rene. By the way, Charlie's neighbors, I understand, are happy since he has put his new TVI-proofed final on the air. The line-up at W1FH now consists of a Collins into the 4-250A final: antenna is still the dual three-element Mims.

In case you work KG4AK who operates on 7, 14, and 28 mc., you just might be interested to



CR5AM and the family.

know he is ex-W6RYA and ex-W2PMT. . . . It is good to see F9BO in the Honor Roll. He has worked all the Zones but needs cards from 19, 23, and 39.

W6EPZ, after running second best to W6ITY (both of them live in San Diego), is quite convinced that rhombics do some good. EPZ immediately started to look for a ranch but decided he had better forget it inasmuch as he has ten more years to do in the Navy. Epsie says that some of the gang might like to know that ZD6HJ QSLs promptly. Another thing he can't quite figure out is why he got a QSL card from PJ5FN for a contact he had with PJ5CW.

Margaret, at W8BFQ, still handles a wicked mike as is shown by her working an additional fifteen countries in the past two or three months. . . . W3CHH dropped in to see Perry Ferrell the other day and told him he has about two thousand QSL cards to send out for his QSOs made from Guam and Iwo Jima. He wants the gang to be patient, as he intends to stick with it until they are all mailed.

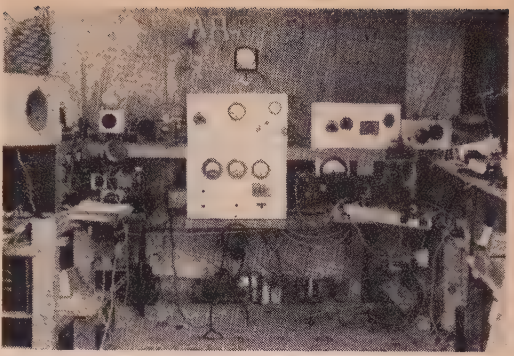
W4GG had just about given up hope of ever hearing from FO8AC, when in popped his card. . . . For two or three years, W4VE has worked all his 20-meter stuff with a dipole. As Doc says, this has always given him a darn good alibi, but now he goes and tosses his alibi out the window. W4VE is now using a rotary; only two elements, but Doc admits that it really helps. However, he says, previously, it was sort of fun to hear the boys say, "Doc is doing pretty well for a dipole!" It wouldn't surprise me to see him knock off that 40th Zone now.

W1JYH had to knock off work for a couple of days due to the grippe, but as Roger says, "Not quite sick enough to keep me off the air. It's really interesting to see what goes on when most people are at work."

W6CAE, who, incidentally, has held the call since 1922, is another one who isn't having much luck getting Russians to QSL. By the way, CAE started out in 1922 with a Ford coil for a transmitter, later changing to a 5 watter. He is one of the first U. S. hams to work Australia, and this was on 3.5 mc. in January 1925. In 1927, he was issued WAC certificate 107. At that point, he was using 50 watts on 7 mc. with 50 cycles raw a.c. on the plate. Larry is once again chasing DX and is running a kilowatt with a two element rotary.

The little boy from Canonsburgh, W3CRA, sneaks on the air once in a while, and via the grapevine, I find that he is knocking off his share, or maybe more than his share, of DX. As usual, good old Frankie won't talk. He did tell me the other night, however, that he had all forty cards but was just too lazy to send them in. . . . W6GRL blew a bridge filament transformer during the contest, and this little incident left him high and dry.

You can always depend on getting a rise out of someone when you make what appears to be some kind of a statement about countries, or for that matter, a statement about anything. For example, a month or so ago, I mentioned about AC4RF getting through to the Mid-West, but he apparently wasn't getting through to the East Coast. At the time of writing it, I knew it was a mistake, but I thought, "Well, let's see what this brings!" True to form, it got a rise out of one of the boys. In this case, it was W3EVW who said that both he and W3EQA worked AC4RF on December 18. Now, if that had only been sent in for the March issue, I wouldn't have had to assume that AC4RF wasn't getting through to the East Coast. . . . I can't win!!


The operating position at AR8AB.

W1EWF worked CR10AB, 14,001, and VQ8CB on 14 mc., this one being on Chagos Island. W1EWF uses a 75A-1 receiver, while the transmitter winds up with a pair of 810s with a kw in. The driver is a 310B. Oh, yes, EWF also worked something signing F37 who said he was on the Chalons. Possibly some of you can add something to this F37 station, but at this point, I certainly can't.

W6MX received a WAP certificate from the N.Z.A.R.T. It was the eighth one issued and the first to a W station. . . . W2PUD moved 290 miles to Lancaster, Pennsylvania, and now holds the call W3QDZ. It's too bad that Dick has to start all over, but that's what happens sometimes when you jump too far.

ZS2CR is anxiously awaiting a card from either OX3WC or TF5TP. This is the last Zone he needs. . . . W0YXO tells me his friend, W0PNQ, got his beam up in January 1949, and as of January 1950, he had worked all zones and 190 countries. The only confirmation he needs for WAZ is for Zone 23. PNQ has been on the air about a year and a half and has worked over 200 countries. It seems that he is a University of Minnesota E. E. student, majoring in DX. . . .

HC2OT is forsaking his six-meter band nowadays for a little 10- and 20-meter DX. At this point, Steve needs Zones 18, 19, 23, and 39. Since he is scheduled to shove off for another country in 1951, he, obviously, has to make hay and make it fast. (That is, if he wants to make WAZ). He has heard Zones 18 and 23, but so far, not a peep out of Zones 19 and 39. I think he will make it all right, and for that matter, maybe some of you would like to give a tip to Steve on the latest on those Zones.

Some of the boys tell me that FB8XX won't answer stations calling him on his own frequency, but, apparently, some of the Ws haven't found out about this. He generally listens on the low edge. . . . W8SYC was told by VP7NU that he has mailed out 600 QSL cards, and there is another new station there—VP7NM. He is on 20, running about 80 watts.

W6DZZ dropped in on W3FYS a short time ago, and while there, he worked his own station in California with W6VE at the key. I suppose, in one way, you might say that Eddie was talking to himself.

About the time you are reading this, we will be thinking ahead a bit toward the third CQ World Wide DX Contest. Of course, we haven't brought you the final and official tabulation of scores for the 1949 World Wide DX Contest, but the Contest Committee is working feverishly, and we hope to

(*Continued on page 72*)

The YL's Frequency

Conducted by LOUISA B. SANDO, W7OOH*

MANY ARE THE ENGROSSING and heart-warming stories of amateur radio. This one made us feel especially happy.

"I have been reading your stories in *CQ* about YLs, and I thought you might like to hear about one I know that you haven't heard of yet," writes Jim Taylor, W8EEC, op at K4WAR (Camp Gordon, Ga.). "Her name is Ellen Peak, and she has been on the air for about five weeks now (February). The most interesting thing about the story is that she is a victim of polio. Where she got the ambition to go after radio, I'll never know, but she got her ticket and is on the air on ten phone, and she is a very nice young girl, to say the least. Her home is in Birmingham, Ala., or, that is, just outside of Birmingham in a little town called Fairfield. Her call is W4PXO."

"You might be interested in her rig. She is using a Collins 32V-2 and a National NC-173 receiver, and she is getting a 3-element beam soon. Also, you might like to know that the rig was given to Ellen by the Amateur Radio Club of Birmingham. I must say the fellows deserve lots of credit."

Indeed they do, Jim, and many thanks for the news.

YL of the Month

We've felt for a long time that W7 wasn't getting enough publicity. Scouting around for likely prospects to focus the spotlight on produced Toddy Nye, W7LCS, of Seattle, Washington. Toddy protested with, "Golly, my story doesn't sound exciting like some of the other girls you've written about," but don't you agree it is rather special when a gal can keep in touch with her OM via ham radio when he is off at sea and she is home with the jr. ops?

Toddy Nye, W7LCS, of Seattle, YL of the Month.

But, of course, she had to get her ticket first. "When I met Bill in San Francisco in 1939," explained Toddy, "he was W6LXP (now W7IYV), and believe it or not, I had never heard of a 'ham.' We married a year later and moved to Seattle. It took Bill four years to get me interested enough to take radio seriously. He taught me the code, and while he was at sea during the war, I took the radio course at the YMCA Radio School nights. When the teacher told me I was ready to get my ticket, I was so sure I would get nervous and miss the code I decided to try for the restricted radiotelephone permit. After three trys at that and finally passing, my code speed was up to 20 w.p.m., and I was quite well acquainted with the FCC office, so I breezed right through the amateur exam. A year later, in July 1948, I passed the exam for Class A.

"All the effort I put into getting my ticket was richly rewarded when I was able to work Bill from all the different ports in Alaska, wherever his ship happened to be. We had a sked every night on 40 meters. The captain and crew as well were always waiting for any news I might have from home, and they always got plenty of news, even if I had to copy the front page of the paper to find something to send!"

Toddy works 80-meter c.w. as well as 40, especially likes contests, and also checks in on the YL nets on the West Coast. Incidentally, she has her 30-w.p.m. code proficiency certificate and is working on the 35. Toddy also just recently got on 2 meters. "But we live in an apartment and can't put up a beam," laments Toddy, "so we just work around town on 2. We feel lucky to have a 40-meter antenna in the backyard which is an off-center-fed Hertz, 65 feet long. Rig for 40 is a BC-459A and for 80 c.w. a BC-457A, and a 522 for 2. Worked Okinawa once with 15 watts, which is my best DX, but how can you count it when you don't have a QSL? We are working on a mobile rig and hope to have it very soon.

"We are members of the West Seattle Radio Club, and, after being the first YL for a year, the club now has three husband-and-wife teams. We get out the announcement cards for the meetings and have been given the job of writing the club news for the Puget Sound area paper, *QRM*.

"I especially enjoyed your column about the convention in Los Angeles—it sounded like so much fun. We attended the Vanalta Convention in Vancouver, B. C., last fall and were unhappy not to meet any YLs there; as far as I know, I was the only licensed YL that attended. At the Everett Hamfest in October there were six including me: Miriam, W7JFB; Jean, W7LGG; Frances, W7GSR;

(*Continued on page 58*)

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* *Address all correspondence to Louisa B. Sando, Verde Valley School, Sedona, Arizona.*

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gleaned by THE BRASSPOUNDER

HAMS IN THE DENVER AREA are coöperating to remind the rest of the country that their city is not to be forgotten for a moment; on May 7, Denver Day, as many as possible will be on the air to take traffic especially for patients at Fitzsimons and Ft. Logan Hospitals and other military hospitals in the vicinity, as well as to all points in Colorado—these stations will be identified by their call, W0 . . . /DEN, and will be listening for "CQ DEN" from other stations; the Denver Day stations will be grouped on the following freqs.: c.w.—3550–3575, 7100–7125, 14100–14125, 28050–28100; phone—3850–3875, 14200–14225, and 28950–29000; don't forget the date—give the Denver gang a call. . . . **W5NUQ** is sadly missed by his many friends thruout the world—during his funeral it was arranged that a 15-minute silent period be observed by his friends on the 11-meter band, and not a signal could be heard on that band during that time; Doc's xyl, Bessie, wishes to express her sincere thanks to all the hams who were so deeply sympathetic at the time of Doc's passing, and to the contributors toward the wreath bearing the W5NUQ call letters with the inscription "Radio Amateurs of the World" accompanied by QSL cards presented to Bessie.

With more than 150 members, the Tri-City RC includes hams from New London and Norwich, Conn., and Westerly, R. I., with **W1QV** as prexy, **W1RXX**, v-p., and **W1NIX** sec.-treas.; the club's emergency coördinator is **W1BVB**, and their present emergency gear carries **W1NEK** as a mobile job; plans are nearing completion for a club station to be built in Red Cross HQ in New London.

The Atlantic RC, Inc., Atlantic City, N. J., maintains **K2BR** on 40 and 80 c.w. and 75 phone and a rig on the Coast Guard emergency freq.; it is located on the top floor of the Red Cross Bldg.; club officers are **W2SOC**, pres.; **W2CYI**, sec., and **W2PXZ**, treas.

From **G5LK** comes the following communication: ". . . on behalf of my fellows I feel duty bound to publicly announce how deeply grateful we all are for the encouragement so generously given us, not only within our own borders, but from all parts of the globe. We sightless fellows are, after all, just ordinary human beings, and ham radio to us is a great gift amounting to second sight, which is a great uplift to independence. So to all hams and readers of *CQ*, 73, good health, luck and DX, and every success to *CQ*. . . . **W7LZF** has been doing very well with 50 watts, working VUs and other Asians with relative ease—he uses one element of his 10-meter beam for receiving. . . . **W5MRT** became a Daddy lately, which makes **W5MRS** Grandpappy. . . . **W2UMB** recently demonstrated to local Red Cross officials the efficiency of ham radio in getting traffic thru to Wash., D.C.; with seven other locals they have organized a group to serve Red Cross, using fixed, mobile, and walkie-talkie rigs.

Those who missed a QSO with **VP8AP** on Sidney Island in the South Orkney group, or later when the station was operated as **VP8AO** on King George Island in the South Shetland group, will have another chance when it will be heard from another location in the near future; in the land of the penguin and elephant seal, the latter weighing up to 8 tons and rear up to 15 feet high, VP8AP and VP8AO have been heard on 14001 between 0100 and 0200, GMT—**W5GEL** has kept regular skeds with these VP8 stations and expects to continue when the station is set up for operation at the new, unknown at present, location; the expedition is frozen in 9 months of the year and has contact with the world only by QSO, except when their supply ship makes its annual visit. . . . No TVI here, says **W8HSC**, because his town is in a hole and TV signals can't reach it.

When **W9MRK** tried mobile phone on 10 recently, his excitement caused him to attempt to go back to the other fellow by using his car horn with c.w.—only passing motorists were alarmed! . . . It is claimed that **W2CZF** has a pipe line to Australia—he never misses with his 150-watt rig. . . . The new rig that **W0HEL** has sounds swell—in two relay racks it covers from 3.5 to 10 mc and the 6L6, 807, and 100TH to a pair of 304TLs in the final makes the kw job step out. . . . After **W0GBZ** worked **W0AGK**, 500 miles away, on 20 c.w. and got a 599X report, GBZ noticed he had forgotten to hook the antenna to his transmitter. . . . **W3PWA**, a new ham, vacationing in Arkansas, has returned to Wash., D.C. with the thought that ". . . in ham radio you meet some of the finest guys you will ever meet." . . . **W9JGL** has given up trying to keep an invisible antenna strung up—neighbors' pigeons can't see it, either, and demolish the antenna without casualty; JGL is now trying mobile and feels the car will do a better job on pheasants than did the invisible antenna on pigeons.

Those old timers who swore they heard a spark transmitter last Dec. 29 were right—Milwaukee's pioneer hams held their reunion that night and put a rig of 1900 design on the air (without an antenna)—the local TV station announced an

(*Continued on page 62*)

The imposing operating position at W6WFR.

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* *Address correspondence to: The Brasspounder, c/o CQ Magazine, 342 Madison Ave., N. Y. 17, N. Y.*

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The 6-meter Observing Project

O. P. FERRELL, Project Supervisor
EVELYN UHL, Administrative Aid

MARY T. BERGEN, Evaluator
ANN NEWBURY, Tabulator

(This work is supported in part by the non-profit cost-reimbursement Contract No. AF19 (122)-72 and modifications with the U. S. Air Force, through the sponsorship of the Geophysical Research Directorate, Air Materiel Command.) The work of this project is conducted at the following address. All mail should be addressed to RASO, c/o Radio Magazines, Inc., 121 South Broad Street, Philadelphia 7, Pa.

Status of the 6-meter Project

Total Number of Work Group Members:
North America—379
Oceania — 1
South America — 18
Africa — 2

Total Number of Screened Observations—10,831 (1/10/48–6/11/49)
Number of Reports Received (to date)—1752
Observers Inactivated (2/20/50–3/20/50)—1
New Observers: HK1CA, KL7ZL, LU1AM, LU3BD, LU5BM, LU8BQ, LU9AX, VE2AQ, VE3AIB, VE3APV, VE3AJJ, W1CK, W2WGL, W3FZQ, W3LVF, W5MWT, W6DGK, W6GCG, W6GQZ, W6VES, W8VOS, W9CGO, W9RLB, W9DDZ, W0UQM, Blanchard, Gordon (Mrs.), Matthews, Pitt

Participation Certificates to be Issued

As a result of the conference held at the Air Force Cambridge Research Laboratories on March 8 and 9, we are pleased to announce that an agreement has been reached with regard to the issuance of Participation Certificates.

Starting on or about June 15, 1950, handsome certificates will be awarded to observers who have reported faithfully for the previous twelve months. Also, certificates will be issued periodically after this date to observers completing a full year of coöperation in the 6-meter work group. Various suggestions were entertained with regard to the awarding of Participation Certificates. In earlier Newsletters it had been mentioned that the awards would be granted on an activity/reporting basis. It was shown, however, that this method discriminated against observers whose activity might suffer through no fault of their own (for example, prohibitive hours of operation due to TVI, etc.). Therefore, it has been recommended that certificates attesting to individual coöperation in this project be awarded on a strictly reporting basis.

Further details on this announcement will be sent observers in a Special Letter to be issued as soon as details on the design, wording, etc. of the certificates are completed.

RASO to be Represented at Ionospheric Conference

The Pennsylvania State College will be host on July 24, 25, and 26 to a three-day conference and symposium designed to acquaint scientists in the field of physics relative to the upper atmosphere with the latest theoretical and experimental developments. This conference is being sponsored jointly by the Geophysical Research Directorate of the U. S. Air Force and the Pennsylvania State College. Approximately twelve papers will be presented at this meeting by some of the foremost scientists in this field today. Speakers from several foreign countries are expected to participate in the presentations. Several symposia are planned to allow free intermingling of the latest ideas among the international participants. On the agenda at this meeting will be the examination and interpretation of the results of the first year of the 6-meter Observing Program.

RASO Desires Unusual FM/TV Reports

The RASO Office urges all amateurs and SWLs hearing FM or TV signals from over 700 miles distant to report the times, dates, and call-letters. Such reports are incorporated as "Special Notes" in the monthly interim reports submitted to the Air Force Cambridge Research Laboratories. FM or TV reception via sporadic-E is expecially useful in determining the maximum free electron density of the upper atmosphere. Reports may be sent in to the address given above. All reports will be acknowledged.

6-meter Work Group Now Includes more than 400 Amateurs

Readers who have been watching the status of the 6-Meter Project grow from month to month will have noted that the number of participants is now over 400 and that the total number of observations submitted to the Air Force Laboratories at this writing exceeds 10,000. This does not include independent Work Groups now being formed in both Argentina and New Zealand.

Results obtained in the analysis of the first 8000 observations were quite good, and indications are that accuracy and general reporting levels are both on their way up. Several unusual sporadic-E formations have been plotted, while special attention is being paid to the few dates during May and June of 1949 when 144-mc signals were reported over extreme distances. With the outlook for the forthcoming 6-meter DX season indicating it will be one of the best in the post-war years, the 6-meter group is ready and waiting. 100,000 observations for 1950 is the prediction!

RASO DX Schedules

The RASO has established a program of 6-meter DX schedules for the late spring and early summer months. Members of the Work Groups have already been notified. Amateurs contemplating setting up a 6-meter equipment are invited to write the RASO Office to obtain further information on DX possibilities from your locality.

Transmitter Kits and TVI Cures!

LICK TVI

IT'S EASY THE ELDICO WAY!

FREE

"TVI Can Be Cured" booklet —all of the best dope on TVI —is available without charge from ALLIED. Ask for it now!

You can lick TVI these *four ways*, and ELDICO and ALLIED have what it takes to do the job:

1. By complete shielding to prevent direct radiation from the transmitter. 2. By using line bypasses and brute force line filters to prevent kickback through the AC lines. 3. By using W2GX's M derived Low-Pass Filter to prevent radiation of harmonics through the antenna. 4. By using W2GX's M derived High-Pass Filters to prevent the over-loading of the front end of the TV receiver by amateur fundamental signals.

ALLIED *HAS THE TOOLS FOR YOU!*

HERE ARE THE TVI FILTERS

TRANSMITTER DUAL LOW-PASS FILTERS

First line of defense in the transmitter. One should go into antenna; another between driver and highpower final is recommended. 40 Mc cutoff—over 75 db harmonic attenuation. 52 or 72 ohm input and output. For other impedances, use an antenna tuning network. Good for 1 KW input; negligible fundamental attenuation; no effect on antenna performance.

77-605. TVD-62 for 52 or 72-ohm coax. In kit form, *only* **$7.99**

77-559. As above, but wired and tested, *only* **$10.99**

TVD-104 Diaxal for use with paired RG-8/U or RG-58/U or approximately 100-ohm coax.

77-607. In kit form, *only*........................ **$14.95**

77-606. Wired and tested, *only*................ **$17.95**

RECEIVER HIGH-PASS FILTERS

Essential filters to install directly at antenna coil of the TV receiver. 40 Mc cutoff; no attenuation to signals above 40 Mc. Efficient on any TV set; insertion loss negligible; will not affect signal quality or strength. Available for coaxial or 300-ohm ribbon feed lines.

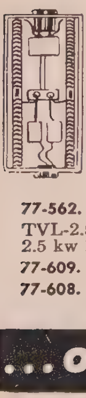
77-604. TVR-62 for coax. In kit form, *only*........ **$1.98**

77-560. As above, wired and tested, *only*.......... **$3.98**

TVR-300 High-Pass Filter for 300-ohm line.

77-603. In kit form, *only*........................ **$1.98**

77-561. Wired and tested, *only* **$3.98**



BRUTE FORCE LINE FILTER

R.F. that feeds back through the A.C. line is a potent source of TVI. These line filters will completely eliminate this cause of interference. Minimum installation. Patterned after model recommended page 508, ARRL 1949 Handbook.

77-610. TVL-1KW for total maximum power from AC supply line of 1 kw. In kit form, *only*...................... **$5.98**

77-562. As above, but wired and tested, *only* **$8.98**

TVL-2.5 KW for total maximum power from AC line of 2.5 kw 110 or 220.

77-609. In kit form, *only*...................... **$11.98**

77-608. Wired and tested, *only*................. **$17.98**

... ORDER TODAY.....

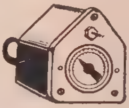
HERE ARE THE "SNOOPERS"

GDO GRID DIP OSCILLATOR

Here's the most valuable piece of test and measuring equipment in the ham's shack. Amateurs using it have saved countless hours in building, improving and de-bugging rigs. Locates resonant circuits without applying power to rig; measures harmonics, permits accurate neutralization, helps eliminate parasitics, etc. The improved GDO kit builds an exact duplicate of the famous Grid Dipper, and incorporates regeneration; includes everything from special handy case permitting one-hand operation, down to instruction book. Complete with tube and internal power supply, range 3 mc to 250 mc in six steps; size 5½"x2⅜"x3".

84-964. GDO Kit. *Only*........... **$24.50**

HARMONIC CHASER



Modified absorption type wavemeter designed to eliminate swamping by the fundamental when unit is tuned to harmonic. Identifies and records strength of your harmonics falling into all 13 TV channels. For use with external sensitive indicating meter.

77-600. TVH, complete kit, with instructions....... **$4.98**

77-601. TVH, wired and tested..................... **$9.98**

77-602. TVH 500 microamp. meter in matching case. **$6.50**

ALLIED RADIO

ALLIED RADIO CORP., Dept. 16-E-O
833 W. Jackson Blvd., Chicago 7, Ill.

☐ Send FREE "TVI Can Be Cured" Booklet No. 37-039.

Send following ELDICO Equipment:........

....

$..........enclosed. ☐ Full payment.

☐ Part Payment, bal. C.O.D.

Name..

Address.......................................

City...............Zone....State......

HK-A-4722

FREQUENCY SHIFT EXCITER

For radio-teletype, radio-photo, and facsimile transmission

A "must" for stable, dependable operation for

LONG PERIODS OF UNATTENDED SERVICE

SPECIFICATIONS

- **Output Frequency Range**—Optional 1.6-5 mc. or 2-7 mc.
- **Output Power**—3 watts into 50-75 ohms.
- **Frequency Shift**—Adjustable from 50 to 1000 c.p.s.
- **Monitor Output**—200 millivolts across 50-75 ohms.
- **Keying Signal**—Optional, positive or negative to ground. Positive keying voltage—50 volts. Negative keying voltage —10 volts.
- **Keying Speed**—To 600 wpm.
- **Overall Stability**—(1) 10 c.p.s. for ambient range from 0°C. to 50°C. (2) 25 c.p.s. for line voltage variation of plus or minus 10%.
- **Keying Bias**—Less than .5 millisecond.
- **Crystal Positions**—Three (3).

Coming!

For the latest in Frequency Shift Equipment, write for data on the new HK Crystal Controlled F. S. Receiver and Converter now under development.

THE ROBERT DOLLAR CO.

COMMUNICATION HK EQUIPMENT DIV.

SAN FRANCISCO CALIFORNIA

Export Agent

The M. Simons & Son Co. • 25 Warren Street • New York

Cable address: SIMONTRICE

The Social Side

ROCHESTER—The Rochester Amature Radio Association announces that its annual hamfest has been scheduled for May. 13, 1950, at the Liederkranz Club, 660 Main Street West, Rochester, New York. Registrations starts at 2:00 P.M. Afternoon activities will include discussions on emergency operation, traffic handling, DX, and v.h.f. development. Special events for the ladies. Dinner will be served at 7 P.M. All this, and more too, for $3.75. Contact W2QY for further information.

ILLINOIS—July 16th. Weldon Springs Picnic, 4 miles east of Clifton, just off state route 10 or U. S. route 51 at Weldon Springs State Park. This is a picnic for all the family. Bring your own basket lunch. Positively no charge! Free soft drinks. Sponsored by Cenois Amateur Radio Club, Central Illinois Radio Club, Clinton Radio Club, Twin-Cities Radio Club, and Sangamon Valley Radio Club. W9KQL can supply further info.

The annual hamfest of the Starved Rock Radio Club, of Utica, Illinois, will be held this year on June 4th at Boy Scout Camp KI-SHAU-WAU, near Starved Rock State Park. This affair has become one of the high points of the summer for midwest hams, and a big turnout is expected this year. There is plenty of room for all the good things that come with a SRRC hamfest, as the 500 who attended last year can testify. If you need further particulars, including detailed information on how to get to the site, contact the secretary, W9QLZ, at Box 22A, Utica, Ill.

DETROIT—The Great Lakes Division A.R.R.L. Convention will take place this year at the Hotel Statler, Detroit, on May 27–29. An extensive program has been lined up for the affair, with all of the prizes and activities usually associated with conventions. The registration fee is $3.50, and the Sunday evening banquet will cost you another $4.25. If the two tickets are purchased together the total cost will be only $7.50. The General Chairman of the convention is Ty Kirby, W8TDO. The address for advance registration, and a crack at the advance-sale prizes, is P.O. Box 903, Detroit 31, Michigan.

TEXAS—The annual convention of the South Texas Emergency Net will be held in Cuero again this year, on May 27th and 28th. All amateurs, XYLs, and other interested parties are invited to attend. Registration will begin at the Legion Hall in Cuero at 9 A.M., and programs will begin at 1 P.M. The YLs and XYLs will enjoy special programs arranged for them. A Sunday noon highlight will be the barbecue in the City Park especially prepared by Police Chief Taylor of Cuero. Tickets may be otained from Robert Crossman, W5OUA, Box 214, Rockport, Texas.

RID ASSOCIATION

On February 21, 1950, a number of former employees of the FCC's Wartime Radio Intelligence Division met in Washington, D. C. for the purpose of forming an Association of persons who assisted in the Commission's Radio Intelligence Division activities during World War II. The purposes of the RID Association are to perpetuate the fellowship existing between the men and to maintain a roster of persons who, as members of the FCC's, NDO, FBIS, Field Division, and RID, articipated in radio intelligence activities. The group will hold its annual meeting and dinner in Washington, D. C. on May 5, 1950. Any former employee of the aforementioned groups who desires to affiliate with the association is invited to submit his name to Merle Glunt, 10003 Gardiner Avenue, Silver Spring, Maryland.

ESSE

CLOSE-OUT SALE

BC-348 Communications Receiver with 24 V. dynamotor. Used but excellent cond.	$100.00 ea.
HRU (DC Power Unit) 24-28 V. at 70 amps. 2000 watts gasoline engine generator with starter. Used but excellent	$60.00 ea.
Low impedance headsets HS-33's. Used but excellent	$1.50 pair
T-17 Microphones. New	$1.50 ea.
T-17-B Microphones. New	$2.25 ea.
BL-Selenium Rectifier, type 23751. 110, 120 V. AC input; 110, 135 V. DC output at .75 amps. New	$1.25 ea.
Collins AN/ART-13 Transmitter. Used. excellent condition	$180.00 ea.
BC-221 Frequency Meter. Covers 125-20,000 Kc. Almost new	$60.00 ea.
With modulation	$80.00 ea.

CASH! CASH! CASH!

For Anything Electronic Attention FACTORIES, HAMS, DEALERS, INDIVIDUALS Anybody

If you have surplus condensers, resistors, radio tubes, transmitters, receivers, power supplies, frequency meters, transformers, speakers, headphones, microphones, telephones, or anything else in our line that you no longer need or is surplus, write immediately to Esse Radio Company and get our offer. We are especially interested in large quantities. We offer cash and promise to answer immediately. Give us a full description in your first letter and quote us price. We will not answer any letter unless descriptions and price is quoted. During January of 1950, Esse purchased thousands and thousands of dollars worth of equipment.

Do you have?

BC-348's, AC or DC models
ART-13 Transmitters
ART-13 Transmitter dynamotors
BC-312 Receivers
BC-221 Frequency Meters
SCR-522 Transmitters & Receivers
BC-610 Transmitters
BC-342 Receivers
Hallicrafters, National, Tempco, RCA, Collins, RME, Hammarlund, Millen, Meck, Harvey-Wells, Meisner, Sonar, McMurdo-Silver, Gonset, Stancor, Budd, etc. transmitter or receivers
BC-244 Receivers
SCR-269F or G Automatic Direction Finders

WHAT HAVE YOU? Esse will buy. Factories, send us a list of that surplus.

AUCTION SALE!

THE TIME: Saturday, May 13, 1950, starting at 10 AM 'til everything is sold if it takes until midnight.

WHERE: Esse Radio Company, 42 West South Street, Indianapolis, Ind.

Esse Radio Company will sell, at public auction, new and used surplus and currently manufactured radio electronic gear at your prices. This is a gigantic undertaking. Thousands and thousands of dollars worth of merchandise will be sold. We invite you to come to this sale and promise it will be of tremendous interest.

Marlin P. Maddux, well-known auctioneer, will be in charge of this sale. Terms of the sale are cash. Come early to register. We are going to sell some or all of every item in our store during this sale. We especially want other dealers, who are interested in buying, to attend this sale as well as individuals buying for their own use.

Although this sale, to be held May 13, 1950 will perhaps be the largest auction sale that Esse will hold, Esse will continue to have auction sales the 2nd Saturday of each month; so, if you can't come to our first sale, attend others.

Consign your surplus gear to Esse Radio Company for this sale, Esse will sell your equipment for a 15% commission. If you have anything that is connected with radio such as transmitters, receivers, tubes test equipment, power supplies, condensers, speakers, amplifiers, modulators, dynamotors, etc., regardless of make, send it, or them, to Esse, transportation charges prepaid, and Esse will sell your merchandise for you on this sale. Your equipment should bring highest prices. Individuals, factories, radio clubs, other dealers, just anybody, send your equipment, transportation charges prepaid, to Esse for this tremendous sale. You will be placing your gear in the hands of experts for this sale but with the understanding that the consignment of material is final and without recourse as to the prices that it will bring. Everything sold on the sale goes to the highest bidder regardless of what the bid amounts to; however, we beleive that the return that you receive for your gear will be fair. Help make this sale a bigger success. Send in your gear and what-not to Esse (all transportation charges must be prepaid). Within five days after the sale, Esse will send you a check for whatever your gear brings except for a 15% commission that Esse will charge you for handling. Act Today! You must hurry to get your equipment to Esse in time for the sale (you don't need to correspond or contact Esse. Just send the gear in.) If you cannot get your equipment to Esse for this sale, send it in anyway for the auction sale June 10, 1950. Remember, Esse will hold an auction sale the 2nd Saturday in every month and will accept consignment of merchandise for any sale. . . . .

ESSE RADIO CO. 42 W. SOUTH ST. INDIANAPOLIS, INDIANA

menting the plan can be attacked. To aid in the implementation of the plan, the IFRB, the International Frequency Registration Board, a permanent organ of the Union, was set up at Atlantic City. Members of the IFRB have participated in all the work of the PFB. Thus after the PFB's work is revised and declared suitable for implementation, the IFRB can efficiently step into its role of supervising the enforcement of whatever agreements are made.

"Now as all of you gentlemen know, it is one thing to set up organizational machinery and yet another to make the machine run. It was originally anticipated that the work of the PFB would be completed by last May and that the special conference to review its work would have been held this last October. However, the special conference will not be held until September of 1950. This delay is symptomatic of how much more difficult the task of constructing a new international frequency list has been compared to what was envisaged by those of us who participated in the Atlantic City conferences. In fact, this whole last year has been one of crisis after crisis insofar as the drafting of a new international list is concerned."

TVI ELIMINATION

(*from page 21*)

to 500 watts, antenna connected. The TV set across the street (100 feet away) showed extremely slight cross hatching on Channel 2, all other channels were clear. The set in the apartment below (9 feet away) was clear on all chan-

"Hams" record QSO's on Low Cost Ampro Tape Recorder!

Only
$94.50
Complete with microphone, take-up reel, radio - 'phono plug, speaker and amplifier

Magnetic erasure allows using tape over and over again

RECORD TRANSMISSION of other amateurs, play it back to them for "quality" checks.
IDEAL FOR PRACTISING and perfecting code sending and receiving.
RECORD MESSAGES on low cost tape for later broadcast.
RECORD QSO's on tape, phone or CW . . . build up a collection. EVERY "HAM" OWNER has found an amazing number of uses for this new AMPRO Tape Recorder. See it at your dealers or write "specs" . . . fill in and mail today for full details and coupon now

WRITE TODAY for full details on this new Ampro Tape Recorder and Playback

NEW, LIGHTWEIGHT, PORTABLE UNIT LETS YOU RECORD OR PLAYBACK UP TO 2 FULL HOURS ON ONE 7" REEL!

More and more amateur radio "hams" are using this new low cost Ampro Tape Recorder. Compact, weighing only 15 pounds, it offers greatest operating economy . . . puts twice as much recorded material on each reel of tape. Simple to operate, complete in one case, this new recorder is designed, built and guaranteed by Ampro—leading builder of precision motion picture equipment for over 20 years.

- Lowest first cost for a precision unit
- Greatest operating economy
- Lightest weight, only 15 pounds
- Recording speed—3.75" per second
- Voltage—105/120 volts, AC 60 cycles
- Amplifier—3 stage AC high impedance in-put
- Recording head—RF bias, dual track
- Plus a host of other exclusive Ampro features

Ampro Corporation
2835 N. Western Ave.,
Chicago 18, Ill.
Gentlemen:
Please rush me full details and specifications on the new Ampro low cost tape recorder.
Name ....
Address ....
City ....
Zone ...... State ....

HARVEY *for variety —for bargains*

THE NEW SUBRACO MT 15X

The finest in mobile rigs available today. 30 watts power, class B 100% modulation, with push-to-talk and built-in coaxial type antenna relay. Xmttr complete with tubes, coaxial antenna connector, mounting brackets, etc. *Shipping weight 15 lbs.* **$87.50**

BRAND NEW—MT15X for 20 meters $87.50

(Same features for 20 as for 10-11.)

Speech input. Any of the MT15X can be ordered with high-gain speech input for either xtal or dynamic mikes at an additional cost of............................**$9.95**

SUBRACO DS400

Dynamotor supply. 6 V. DC input, 400 V. at 175 ma. output. Complete with built-in control relays, filter, etc. *Shpg. Wt. 10 lbs.*........................**$59.95**

AC Supply for operation of any of above Subraco xmttrs indoors. Complete with rectifier and built-in control relay..**$39.50**

AIRCHARGER MODEL 616

6 volt wind charger, with 5 ft. tower and universal mounting brackets. Built-in brake assembly for remote shut-off. Automatic governor. Complete with control panel, battery cut-out and ammeter. Will charge in 5 to 6 mile breeze. Max. Chg. rate 15 amps. at 1100 RPM. Brand New, with full installation instructions. *Shpg. Wt. 85 lbs.* Very specially priced at......**$34.95**

SOUND-POWERED FIELD PHONES

Army type EE-108. Any number can be hooked together on any 2-wire or grounded line. Max. range 12-15 miles. No batteries needed, simple, few parts. Complete instruction manual. Genuine leather case with strap. *Shipping Weight 10 lbs.* Each......................**$24.50**

NOTE: All prices are Net, F.O.B. N.Y.C. and are subject to change without notice.

BC-221 FREQUENCY METER

These won't last long so order now for one of these famous freq. meters. They are just like new, with original calibration charts. Range 125-20,000 kc, with crystal check points in all ranges. Complete with crystal and tubes. **Special Price $79.50**

HRO-50

The new HRO again sets standard of receiver performance. Range 50-430 kc., 480 kc.-35 mc. 8 watts output; built-in power supply; negligible drift; direct frequency calibration. *Shpg. Wt. 100 lbs.* **Complete, less speaker $335.00**

COLLINS 75A-1

80, 40, 20, 15, 11 and 10 meter ham receiver. Automatic noise limiter, high sensitivity, double conversion. With speaker in matched cabinet. *Shpg. Wt. 93 lbs.* **$375.00**

HIGH VOLTAGE POWER SUPPLY KITS

All standard brand, new components, power supplies designed to take it. Conservative as the big commercial jobs, you can safely count on trouble-free performance from the day you solder the last connection. Each supply comes complete (less chassis and rectifier tubes) with plate transformer, separate filament transformer (for HV1500-866A fil. trans. —other models supplied with 872 fil. trans.), control switch, pilot light assembly, smoothing chokes — two matched huskies—two oil-filled condensers, bleeder, rectifier sockets and safety plate caps, Jones strip for chassis connections, and heavy-duty a.c. line cord. Voltages available are:

Kit No.	Output	Price	Transformer only
HV-1500	1500 v. 350 ma.	$29.50	$19.50
HV-2000	2000 v. 500 ma.	69.50	39.50
HV-2000SP	2000 v. 700 ma.	89.95	49.95
HV-2500	2500 v. 500 ma.	99.95	69.95

TR-1 TRANSMITTER KIT

A conservative 300-Watt phone and c.w. rig 6V6-6V6-6L6-813, Class B 811 modulators. All bands, 80, 40, 20, 15, 11, and 10. Exciter broad band, single control PA tuning. Three power supplies delivering 1500 v.d.c. at 350 ma, 500 v.d.c. at 200 ma, and bias supply. Punched aluminum chassis, tubes, transformers, capacitors, resistors, antenna changeover relay, meter, wire, hardware and coils included, but final tank coil for one band only. Electro-Voice 915 high level crystal microphone part of the package. Plug in the crystal and line cord and you're on the air. Shpg. Wt. 180 Lbs...............................Only **$179.50**

TR-75 TRANSMITTER KIT

Loafing along at 75 watts this is the c.w. man's buy of the year. Simple enough for the beginner to assemble. Punched chassis. Uses the time proven 6L6 oscillator-807 amplifier combination. Pi-network output. Husky power supply delivers 600 volts to the 807. Complete...including a punched chassis and a smartly shielded cabinet to minimize television interference. Unbelievably low priced at **$34.95**

Shpg. Wt. 80 Lbs.

GDO GRID DIP KIT

The most valuable piece of test equipment in the ham shack is the Grid Dipper. Build one with this kit and save countless hours in building, improving and de-bugging your rig. The GDO Kit builds an exact duplicate of the "Grid Dipper" and includes everything from the special handy case permitting one-hand operation down to a complete application and instruction book. With tube and internal power supply, range 3 Mc to 250 Mc in 6 steps, size 5½" x 2⅜" x 3". **Complete Kit $21.50**

COPPER MESH SHIELDING

Heavy Duty, tightly wound, expensive but it really does the job right, the only screening we've found that will. 36" wide, minimum order 6 sq. ft. **Per sq. ft. $.85, plus $.50 per order packing.**

See our April ad for complete information on Eldico equipment.

Write for your FREE copy of our TVI book.

Telephone: LUxemburg 2-1500

hrc

HARVEY RADIO COMPANY INC.

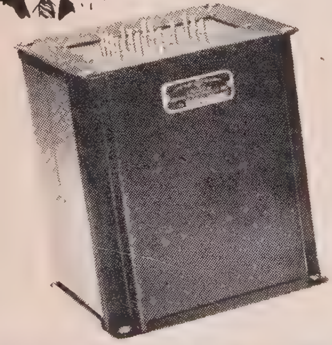
103 West 43rd St., New York 18, N. Y.

nels with non-objectionable lines on Channels 2 and 13. This was certainly a long step in the right direction. The antenna load was reduced to 250 watts and amplitude modulated with a pair of 809s. At first the rig was heard on every channel until the modulation gain was adjusted; over-modulation was the cause of the TVI. A low pass filter will be installed in the antenna circuit and stubs hung on the lead-in.

My neighbor in the adjoining apartment house, who was clear of TVI on 20 c.w., complained that every channel showed lines. There was nothing mysterious about this. Her antenna was broadside the voltage end of a folded-dipole. The TV antenna was a simple dipole 19 feet under mine. A reduction of power cleared up the case. If more power is to be used, a high pass filter will have to be installed at the TV set.

Summary

1. Obtain a copy of June 1949 *CQ* and study Rand's article on TVI. Take a long look at the rig and jot down all possible causes of TVI.
2. Make a survey chart *before* making any changes in the old rig. A study of the chart will enable you to bring together a clear picture of the rig's behavior under operating conditions.
3. Make a sketch of the rig and its relationship to the TV set or sets, including lead-ins, antennae and power lines. This type of sketch will tell you the possible points where the stuff is leaking into the lines, or out of the cabinet, or antenna to antenna.
4. Although it is true that shields sometimes cause more trouble than the lack of them, shielding everything possible is by far the best bet.
5. Television is here to stay, so accept the fact that only the revolutionary changes suggested in *CQ* articles for the past year will end the interference.
6. Getting rid of TVI is just as much fun as working DX.
7. There is no mystery to the causes of TVI—there is a reason and remedy for *every* case.
8. If you have difficulty in interpreting your charts, restudy the known information.
9. A year ago, 90 to 100 watts input blacked out every picture within 100 feet. Today, running 250 watts input, amplitude modulation, and 550 watts c.w., the signal is neither seen nor heard within the same radius.
10. A TV set 9 feet away is capable of operation on all channels with perfect reception and with non-objectionable interference on Channels 2 and 13. This particular TV set has no line filter, high pass filter, or stub, my vacation having interrupted experiments.
11. Don't expect one a.c. line filter at the transmitter to do all the work. Treat each power line, d.c. line, bias line, or relay control line, as though that alone is the cause of your a.c. feedback.
12. Clean up the cabinet. If the rig is open, put the r.f. portions under a complete shield.
13. If you have to go crystal control to keep the harmonic traps working, be content with that slight restriction.
14. "Feedfront" can be greatly minimized by keeping the standing waves on the feedline to a minimum.
15. In spite of the success obtained in one particular case, TVI might show up elsewhere. Don't despair or give up—it merely indicates an incomplete job. Get the June 1949 *CQ* issue for sure; the answer is there.



"It's KENYON Transformers For My Rig Because They Always Put Out!"

Hams everywhere specify KENYON "T" Line Transformers! Manufactured under rigid standards, all KENYON transformers are constructed of the finest grades of material plus the skill and long experience of a highly trained competent operating staff.

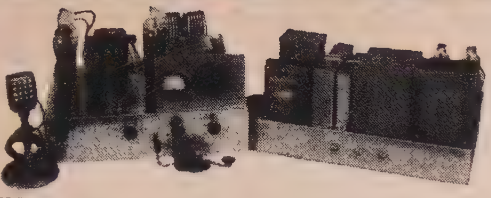
All KENYON transformers are checked progressively in the course of manufacture and are laboratory-tested upon completion to insure satisfaction. Yes, KENYON "T" Line Transformers meet the most exacting requirements of critical purchasers. For skillful engineering, progressive design and sound construction — *Specify* KENYON for top performance in your rig!

KENYON TRANSFORMER CO., Inc.

840 BARRY STREET
NEW YORK, U. S. A.

SENSATIONAL *Savings* on NEW ELDICO KITS

made possible by "Surprise" Trade-In Allowances on your Used Equipment

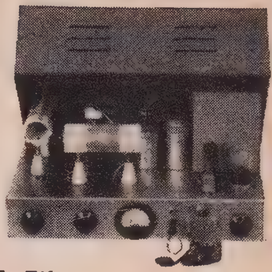


TR-1 300 watts Input Transmitter Kit

Phone & CW. 813 final. PP Class B 811 modulators. Complete with meter, antenna relay, microphone, tubes and final coil for one band..................**ONLY** **$179.50**

TR-75

75 watt Input Transmitter Kit



For the CW man. 6L6 osc, 807 Final, Pi-network Ant. Tuner. Complete; nothing else to buy. Ideal for beginner or just the thing for the OT's standby rig.

ONLY **$34.95**

MD-40 Low Power Modulator Kit	**$29.95**
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GDA Grid Dip Oscillator Kit	**$21.50**

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Receiver Hi Band Pass Filter Kit

Model TVR-62 coax or TVR-300 twinex ....ea. **$1.98**

(wired and tested)....$3.98

Line Filter Kit Model TVL $5.98

(wired and tested)....$8.98

Transmitter Low Band Pass Filter Kit

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TVD-62 (wired and tested) $10.99

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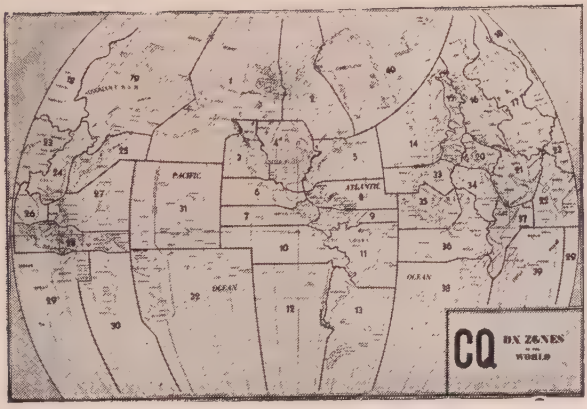

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342 Madison Ave., New York 17, N. Y.

Sirs: I enclose $1.00 for which please send me a "WAZ—DX ZONE MAP OF THE WORLD.

Name ....

Address ....

City .... Zone ..... State ....

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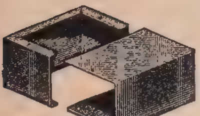
Available Immediately
FROM OUR STOCK



There are thousands of uses in the fields of radio and electronics for these new boxes. They are made from heavy gauge aluminum. The design of the box permits installation of more components than would be possible in the conventionally designed box of the same size. It is of two piece construction, each half forming three sides. The flange type construction assures adequate shielding. Available in etched aluminum finish and gray hammerloid finish.

Catalog Numbers					Dealer
Gray	Etched	Length	Width	Height	Cost
CU-2100	CU-3000	2¾″	2⅛″	1⅝″	$ .50
CU-2101	CU-3001	3¼″	2⅛″	1⅝″	.50
CU-2102	CU-3002	4″	2⅛″	1⅝″	.50
CU-2103	CU-3003	4″	2¼″	2¼″	.70
CU-2104	CU-3004	5″	2¼″	2¼″	.72
CU-2105	CU-3005	5″	4″	3″	.72
CU-2106	CU-3006	5¼″	3″	2⅛″	.72
CU-2107	CU-3007	6″	5″	4″	.81
CU-2108	CU-3008	7″	5″	3″	1.05
CU-2109	CU-3009	8″	6″	3½″	1.68
CU-2110	CU-3010	10″	6″	3½″	1.80
CU-2111	CU-3011	12″	7″	4″	2.34
CU-2112	CU-3012	17″	5″	4″	2.76
CU-2113	CU-3013	10″	2″	1⅝″	.78
CU-2114	CU-3014	12″	2½″	2¼″	.96
CU-2115	CU-3015	4″	2″	2⅜″	.60
CU-2116	CU-3016	4½″	2¼″	1½″	.66

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and Marine Mount
for 2 and 3 Mc.

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Premax Series B Marine Radiators will increase effective power five times over that radiated by a straight whip. The 2-foot base section, 18-inch coil and 6-foot whip (9½ feet overall) resonate at the center of the 2–3 Mc. band. Stainless steel whip, glyptol-coated coil, aluminum alloy base. Two styles of ceramic insulators available. Type V shown at right.

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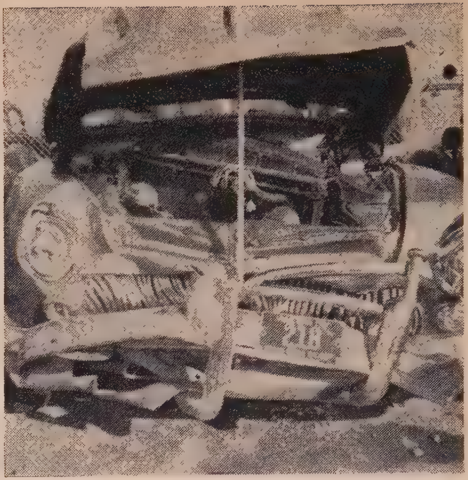

See Page 3

CLASS C AMPLIFIER DESIGN

(from page 14)

2. (7 mc) $L = \dfrac{2600}{12 \times 6.28 \times 7000} = 4.9\ \mu h$

3. (14 mc) $L = \dfrac{2600}{12 \times 6.28 \times 14000} = 2.46\ \mu h$

4. (21 mc) $L = \dfrac{2600}{12 \times 6.28 \times 21000} = 1.64\ \mu h$

5. (28 mc) $L = \dfrac{2600}{12 \times 6.28 \times 28000} = 1.23\ \mu h$

Then, from a reactance rule or resonance calculator, determine the total tuning capacitance.

3.5 mc, $L = 9.8\ \mu h$, $C = 215\ \mu\mu f$
7.0 mc, $L = 4.9\ \mu h$, $C = 105\ \mu\mu f$
14.0 mc, $L = 2.46\ \mu h$, $C = 54\ \mu\mu f$
21.0 mc, $L = 1.64\ \mu h$, $C = 35\ \mu\mu f$
28.0 mc, $L = 1.23\ \mu h$, $C = 25\ \mu\mu f$

The output capacitance of this tube is only 2.1 $\mu\mu f$ so it may be neglected.

Since the amplitude modulation is to be used, the peak voltage across the capacitor will be nearly 2,000 or 4,000 volts, depending upon whether or not the capacitor rotor is grounded, so the tuning capacitor should be selected with this in mind.

(QSY to page 57)

The circulating tank current may be calculated as follows:

$$I = I_{ac} \times Q_{oper} = 0.25 \times 12 = 3 \text{ amps}$$

This current is not too high to preclude the use of normal r.f. switches or banana plugs.

The grid and plate coils may be wound by cut and try or with a grid dipper until they resonate with the correct values of capacitance. A coil calculating chart will aid a great deal in winding both plate and grid coils, but a grid dip meter really simplifies the job.

It is beyond the scope of this discussion to outline the principles used in selecting bypass capacitors, screen grid protective schemes or other considerations because they are well described in many publications. However, the facts herein contained should give a fine foundation to the amateur who enjoys applying some engineering to his transmitter, and the personal satisfaction derived from designing an important portion of it, as well as building it, should be considerable.

MOBILE CORNER

(*from page 33*)

DX Note: CN8ET Johnny (ex-W3KZQ, formerly a Washington, D. C., mobile) operates each Saturday morning from 1300 to 1500 GMT on 29.640. He makes a special effort to work mobiles—if he can hear them at all, he gives them a call. Here's a chance for Africa on your WAC.

Phone Patches

While phone patches are not exclusively a mobile topic, they are used a great deal with mobile stations. There are a few possible sources of difficulties (with FCC, the telephone company, and the public) which warrant the suggestion of the following: Do not modulate with the "clicks" of the dialing or a busy signal. Do not put the telephone operator's voice on the air. Get permission from the called party to put them on the air before doing so. In short, do all the preliminaries before patching through.

(*QSY to page 58*)

WHILE THEY LAST ! ! !

COMMAND TRANSMITTERS AND RECEIVERS SOLD "AS IS" (USED) LESS TUBES:

BC-454—455 .... **$3.50**
BC-457—458 .... **$3.75**
BC-453—495—696 ....

BC-223 Transmitter & Spare Parts:

30 Watt Transmitter with crystal or MO control on four preselected channels, 2000 to 5250 KC., by use of three plug-in coils. Five Tubes: two 801 & three 46. With TU-17 Tuning Unit 2000 to 3000 KC. and Cable, less mtg. . . . **NEW: $24.95**

SPARE TUBE KIT—Contains 5 spare tubes in metal box. Price **$4.95**

TUNING UNITS: TU-18 3 to 4.5 MC. TU-25 4.5 to 5.2 MC. Price—Either .... **$3.50 Ea.**

PE-125 VIBRATOR POWER SUPPLY f/BC-223 Transmitter. 12/24 V. input; output 500 V. 150 MA. . . . . . **NEW: $9.95**

SPARE VIBRATOR AND TUBE KIT—Contains 2 spare tubes, 2 spare vibrators and fuses in metal box. Price **$4.95**

CABLE only—Transmitter to Power Supply **$1.75**

GENERATOR — 12 VOLT 100 AMP.

Mfg. by Emerson 5400 RPM with 5/8″ x 3/4″ shaft and 4 mtg holes on each end for right or left. Motor size: 7 3/8″ x 4 3/8″. Price **$12.95**

Whip Antenna Equipment Mast Bases—Insulated:

MP-132—1″ heavy coil spring, 2″ insulator. Overall length: 11½″. Weight 2¾ lbs. Price **$3.95**

MP-22—Spring direction of bracket. 4″ x 6″ mounting. Price **$2.95**

MAST SECTIONS FOR ABOVE BASES:

Tubular steel, cooper coated, painted, 3 foot sections, screw-in type, MS-53 can be used to make any length, with MS-52-51-50-49 for taper. Price .... per section .... **50¢**

SECTIONS MS-54 or 55 Larger than MS-53 ......**75¢ Ea.**

CANVAS BAG BG-56 for carrying above 5 mast sections **50¢ Ea.**

DYNAMOTORS:

INPUT:	OUTPUT:	STOCK NO.:	PRICE:
9 V. DC. @ 6 V. DC.	450 V. 60 MA. 275 V. 50 MA.	DM-9450 w/Blower	3.95
18 V. DC	450 V. 60 MA.	DM-175	2.95
12 V. DC.	600 V. 300 MA.	BD-86	7.95
PERMANENT MAGNET FIELD DYNAMOTORS:			
12/24 V. DC.	275 V. 110 MA.	USA/0516	3.95
12/24 V. DC.	500 V. 50 MA.	USA/0510	2.95

PM FIELD DYNAMOTOR POWER SUPPLY—Completely filtered. Has two PM Dynamotors as listed directly above . . **$5.00**

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NOW . . . A TELEVISION TOWER YOU EASILY CAN AFFORD!

All steel, welded construction, made of 1/2″ Thinwall conduit, 1/4″ Rod Braces, and 1″ Steel Bands. Made in 10 Ft. triangular shaped sections, tapered, 18″ at base to 3½″ at top. Hinged mounting plates and 2″ mounting hole for Mast, with Guy Rings. 30 Foot Tower is self supporting when mounted on ground. Weight: 75 lbs. Towers dipped in aluminum paint for weather-proof protection and long life. Price: 30 FOOT TOWER, delivered anywhere in U.S.A. **$38.40**

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GUY WIRE: 3/32″ 7 x 7 Strand Aircraft Type, only .02¢ per Ft. WIRE CABLE CLAMPS: 10¢ Ea. TURNBUCKLES: 5½″ @ .25¢ Ea.; 9½″ @ .70¢ Ea.

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TRANSFORMERS (Cased) 110 VOLT 60 CYCLE PRIMARIES:

610 VCT—160 MA. 6.3 V. 3 A.; 5 V. 3 A. CH-610 **$4.95**
700 VCT—120 MA. 6.3 V. 4 A.; 5 V. 3 A. CH-700 **3.75**
800 VCT—225 MA. 6.3 V. 6 A.; 5 V. 4 A. CH-800 **4.95**
700 VCT— 90 MA. 6.3 V. 4 A.; 5 V. 3 A. CH-790 **2.95**

TRANSFORMERS—110 VOLT 60 CYCLE PRIMARIES:

Sec. 12 V. 1 amp. . . **$1.50**
Sec. 24 V. 1 amp. . . **1.95**
Sec. 24 V. 4½ amp. **3.95**
Sec. 24 V. .5 amp. . . **$1.50**
Sec. 36 V. 2.5 amp. . . **2.95**
Sec. 14-14 or 28 V. 7½ or 15 amp. . . **4.95**

CHOKES:

10 Henries—100 MA. 300 ohm. No. CH-100 ......**$ .89**
6 Henries—150 MA. 150 ohm. No. CH-150 ...... **1.25**
13 Henries—250 MA. 120 ohm. No. CH-250 ...... **4.95**
15 Henries— 50 MA. 400 ohm. No. CH-050 ...... **1.00**

BC-645-A Transceiver—

ALSO 110 VOLT TRANSFORMER AND CHOKE

15 Tube Transceiver, ideal for conversion to 460 MC. Frequency coverage 435 to 500 MC. With conversion instruction—Price New and Boxed **$14.95**

TRANSFORMER for BC-645-A — 110 Volt 60 cycle input; output 400 Volt 150 MA. after filter. 12, 9, and 6 V. AC. 4 amps and 5 V. 3 amps. No. CH-645 .... **$2.95**

CHOKE—15 Hy. 150 MA. Order No. CH-646 ..... **$2.95**

PE-101 DYNAMOTOR—13/26 V. input **$2.95**

SELSYN TRANSMITTER & INDICATOR SYSTEM

Ideal for antenna direction indicator to remote position. Complete with Autosyn Trans., 3″ I-81 Indicator, Transformer, and instructions **$6.75**

Autosyn Trans. only: **$2.95** Plug f/I-81: **$1.00**

BLOWER BARGAINS:

110 VOLT 60 CYCLE BLOWER—4″ intake, 2″ outlet. Approx. 100 Cu. Ft. Dis. Motor size: 3″ x 3″. 1750 RPM. Quiet running. Prices: .... **NEW $6.95** **Motor only: $3.95**

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RECEIVERS (274N) Complete with tubes.	Used	New
BC-453: 190-550 kc.	$9.95	$12.95
BC-454: 3-6 mc.	3.95	5.95
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TRANSMITTERS (274N & ARC-5) With tubes, xtals	Used	New
BC-457 or ARC-5: 4-5.3 mc.	$ 3.95	$ 5.95
BC-458 or ARC-5: 5.3-7 mc.	3.95	5.95
ARC-5: 3-4 mc.		14.95
ARC-5: 7-9.1 mc.	6.95	9.95
BC-375: Mod. Trans.		1.49
BC-456: Mod. with tubes	1.95	
BC-375	11.95	
BC-191 (Excell. cond.)	17.95	

RECEIVER & XMITTER
NEW BC-454 (3-6 Mc) RECVR. & choice of either a 274N or ARC-5 4-5.3 Mc. or 5.3-7-mc. Xmtr. Used.
RCVR. & CHOICE OF EITHER $8.95
ALL 3 .... $11.95

MAGNESYN XMITTER AND INDICATOR
For Ham, TV, or Commcl. 110V 60Cy. oper. Complete kit, Instruct. $4.95

PROP PITCH MOTORS
New, original case. Shppg. wt. 55 lbs. $13.95
With transformer 5, 24, and 30 V., 15 amps. $17.95
Trans. alone .. $4.95
Extra Motor .. $3.95

RAX RECEIVERS
8 tubes, 1 antenna and 2 RF sections. Frequency range of rcvr. No. 1: 200-1500 kc.; rcvr. No. 2: 1500-9000 kc.; rcvr. No. 3: 7000-27000 kc. In excellent used condition. Electrically perfect .... each $15.95

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Reports

Some of the fellows have suggested that foreign stations report "mobile calls heard." This column would be pleased to hear from any foreign stations reporting mobile activity.

Miscellany

W2AIS/MM, aboard the "Pioneer Sea," is cruising in some mighty interesting Western Pacific waters these days, and can be heard almost daily by the East Coast gang. Pat has found his MM to be most dependable in keeping him in touch with his family in New York.

The Suffolk County (N. Y.) Radio Club is going in for mobile operation in a big way these days, and have based their emergency communications setup almost entirely on their mobiles. This is one way to be pretty sure of a source of emergency power when the wires go down. They're convinced of the communications effectiveness of 75 mobile, too, since W2NXZ/M worked W0MCK, Des Moines, at 8:30 P.M. with 22½ watts from his chariot on L. I. Is this a record for QRM-time DX?

THE YL's FREQUENCY

(from page 42)

Jessie, W7IHK and Verna, KL7AX, who has been in Seattle for the winter."

Well, so much for radio. But Toddy has other hobbies as well, though we hardly see how she has time for them all. First is square dancing, and she and Bill belong to the "Skirts & Shirts Club." "The boys shirts match the girls skirts," explains Toddy, "and it looks so nice while going through the dances." In the picture, by the way, Toddy is wearing one of her square dance dresses which she made, and she made Bill a sports shirt to match. Other hobbies include studying Italian and photography. Now her OM is trying to get her interested in Morse. "He borrowed a tape recorder from our radio club and is brushing up on his landline Morse (never can tell when you might need it, he says) and he is trying to get me interested," says Toddy, "but, gosh, you can just do so many things!"

We don't see how you do as many as you do, Toddy—you really must be a live wire!

XYL's Club

From VE3ANU, secretary-treasurer of the Kitchener-Waterloo Radio Amateur Club, we learn of the organization of an XYL's club to promote interest in ham radio. The group has elected Mary Fortune, XYL of VE3BGD, as president. Only licensed member at present is Phyllis Stickney, VE3QW. Using the same call as her OM, Phyl can be found on 75, 20 or 10 phone, as band conditions dictate. The club is known as the K-W XYL's Club and is planning to sponsor an annual dinner for the OMs and picnic for the jr. ops.

New Award

Good news! From Hilda Andrew, W4HWR, YLRL has received an offer of a cup, as close a duplicate of the Littlefield cup as possible, to be

DZ2 NAVY AIR BORNE RECEIVER
15-1750 kcs. 8 tube superhet. Uses 6V tubes. Rewire the filament, then all you need is 6V filament 250 VDC B-voltage. Switches, broad-sharp, CW-MCW, lateral-unilateral, etc. This is the finest toned broadcast band receiver ever built. Complete with tubes, excellent condition **$17.95**

TV I.F. STRIP
5 x 14". Contains sockets and all necessary I.F. xformers, all mounted with output xformers. New with 4 peaking coils and diagram **$7.95**

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RADAR CONTROL!
Enclosed in a Bud case 4 x 5 x 3". Leach latch-type relay. Has a 20 ft. cord with push button. Plug into 110V 60 cyc. Push-button to turn on a receiver, electric coffee maker or light from any remote point. Just push the button and the DPST relay closes; push again and it opens. Brand new. Ea. .. **$2.50**

POWER UNIT PE112 Scope power supply. Cotains dynamotor, 27V. input, 350 V @ 120 ma. DC, 18 VAC, output. Also 3-2X2 tubes. Remove H.V. xformer (which has 2 primaries each of 9 V 60 cyc) and you have a suitable xformer for a 7 in. TV or scope supply. Complete with filters, tubes, etc. Good cond. **$9.95**

BC 605 INTERCOM
Convert as on Page 140 in Apr/50 Radio News. ... **$5.95**
For tube buys see our ad Page 56. March/50 CQ!

AM-26/AIC INTERPHONE AMPLIFIER
Uses 2-12J5 input and 2-12A6 tubes output. Excel. cond. **$4.95**

TRANSFORMERS 115 V. 60 CYC. PRI.

400-0-400 @ 200 ma, 5 v. @ 3 a., 6 V. @ 5 a. ..	**$3.95**
2.5 V. @ 10 a., H.V. insulation	**3.95**
5 V. @ 115 a.	**12.95**
275-0-275 @ 60 ma., 5 V. @ 2 a., 6 V. @ 3 a. ..	**2.95**
5 henry 225 ma. Kenyon choke	**$4.95**
1 henry 800 ma.	**7.95**
15 henry 200 ma Thordarson	**3.00**
Filament Transformer primary, 210-250, 60 cyc. 7.5 V. c.t. @ 24 a., 2500 V. insul. mfg. by Collins. New	**4.95**

OIL CONDENSERS

10 mfd., 600V	**99¢**	2 mfd., 600V	**29¢**
2 x 8 mfd., 600V ...	**89¢**	1 mfd., 3,600V ...	**$1.95**
4 mfd., 600V	**49¢**		

BATHTUB CONDENSERS

.5 @ 400V	**39¢**
.25 @ 400V	**39¢**
.1 or 1 mfd. @ 400V	**39¢**
.001 @ 600V. paper **10** for	**$1.25**
500V. mica, assorted **20** for	**$1.00**

EE-8 FIELD TELEPHONE: Uses 2 flashlight batt. Has crank for ringing other phone. Ideal for use in field, mines, camp, house to lab. or garage, etc.
Near new. Per pair **$17.95**

BC-322 WALKIE-TALKIE: 52-65 mcs. Complete with 30 and 33 tubes, and 5,000 kc xtal. Excel. cond. **$10.95**

APN-1 ALTIMETER TRANSCEIVER
Operates approx. 420 mcs. FM designed to give accurate height above ground. Unit can be revamped for the 420 mcs. ham or foundation for citizens' band. Contains 2-955, 2-9001, 5-12SH7, 2-12SJ7. A dyamic vibrating capacitance for producing FM signal. (Makes excellent unit for FM or TV sweep generators.) Many other useful parts. Excellent cond. With plugs **$4.95**

APN-1 DIAGRAM **$1.00**

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ANY section for only .... **35¢**
ALL 7 sections (21') **$2.25**

CONICAL TV ANTENNA: New **$5.95**

ARC-5 TRANSMITTERS: Complete! Excel. cond.!

3-4 mcs.	**$9.95**	5.3-7 mcs.	**3.50**
2.1-3 mcs.	**12.95**	7-9 mcs	**9.95**
4-5.3 mcs.	**3.50**		

ARC5 RECEIVER: 3-6 mcs. **$3.95**

190-550 kcs. ...	**9.95**	6-9.1 mcs.	**6.95**

#6 VINYLITE TUBING new, per 100 ft.	**$2.95**
BC375 or BC191 Tuning Unit, used	**99¢**
274N MODULATOR with tubes, excel. cond.	**1.95**
MICRO SWITCHES with bi-metallic strip. Adjustable to many temp. Normally closed, new, ea.	**59¢**
DPST RELAY 6 V. operation 10 a. contacts. New ..	**79¢**
9 tin miniature socket, new	**18¢**
10 of these for only	**1.50**
MINIATURE TUBE SHIELDS with enclosed spring, new. 10 for	**1.00**

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ULTRASONIC FUNDAMENTALS
By S. YOUNG WHITE

The rapid increase in the use of ultrasonics during the last few years makes it natural that the well-informed sound engineer should want to learn something of the applications and potentialities of this amazing new field. But interest in ultrasonics is not confined to the sound engineer—it is of still greater importance to the industrial engineer for he is the one who will visualize its uses in his own processes.

Elementary in character, ULTRASONIC FUNDAMENTALS was written originally as a series of magazine articles just for the purpose of acquainting the novice in this field with the enormous possibilities of a new tool for industry. It serves the double purpose of introducing ultrasonics to both sound and industrial engineers. The list of chapter headings will indicate how it can help you.

CHAPTER HEADLINES

Too Much Audio. Opportunities in Ultrasonics. Elements of Ultrasonics. Experimental Ultrasonics. Coupling Ultrasonic Energy to a Load. Ultrasonics in Liquids. Ultrasonics in Solids. Testing by Ultrasonics. High-Power Ultrasonics. Notes on Using High-Power Ultrasonics. Applications of Ultrasonics to Biology. Economics of Industrial Ultrasonics.

The applications of ultrasonics have already extended to many industries, and as its possibilities are explored they will increase a hundredfold. To keep abreast of its growth, engineers in all fields must know what they may expect from ultrasonics, how it is used, how the energy is generated, and the techniques of applying ultrasonic treatment to many processes.

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By S. YOUNG WHITE
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given as c.w. award for YLRL's annual Anniversary Party. We hear that W1MCW, Lou Littlefield, has consented to purchase a cup like hers for Hilda. One more incentive for a really good contest! Hilda, by the way, is located at Tampa, Florida, where her OM is a chaplain with the Air Forces. W4HWR runs 600 watts, and you can usually find her on 10 between 28.7 and 28.8.

Winners

There were about 100 logs submitted in the YL-OM Contest, and everyone seemed to enjoy him and herself, even though the conditions on the 10-meter phone band were not good. The OMs experienced difficulties in finding YL contacts. The theme of the contest seemed to be "Cherchez la Femme."

The following are the winners:

YL Phone

KH6TI Dell, Wailuku, Maui, T. H.
W3CUL Mae Burke, Folsom, Pa.
W1QON Eleanor Wilson, Holbrook, Mass.

YL C.W.

W3CUL Mae Burke, Folsom, Pa.
W6YYM Ellen White, San Diego, Calif.
W3NHI Marion Kurtzner, Woodlyn, Pa.

OM Phone

W1BFT Carl Evans, Bow, N. H.
W0ULM Robert Luckenbill, Willow Springs, Mo.
W5OZE Tommy Stinson, Tepton, Okla.

OM C.W.

W1BFT Carl Evans, Bow, N. H.
W0ULM Robert Luckenbill, Willow Springs, Mo.
W4MLH William Rice, Arlington, Va.

CU next contest.

THE MINIREC

(from page 26)

mum capacity, adjust trimmer C_5 until a signal is heard. Next tune the receiver to 5250 and then tune C_2 toward maximum capacity. When you have reached this point the Minirec is aligned. Listen to the Minirec and peak up C_1 for maximum signal, adjusting C_3 either for c.w. or phone reception.

The Power Supply

A small power supply constructed on another of these small chasses supplies power for both the transmitter and receiver. The power transformer and rectifier tube occupy the top of the chassis. The filter choke, electrolytic condensers, and receiver coupling resistor are all crowded underneath. A three-prong female Jones connector on the chassis of the power supply matches a three-prong male connector on the back of the receiver. Another three-prong female connector on a short cable connects to the transmitter. No primary a.c. switch is used because of lack of space, but it is recommended that both a line cord switch and a fused-type plug be incorporated in your power cord.

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3. Unusual bleeding or discharge
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5. Persistent indigestion or difficulty in swallowing
6. Persistent hoarseness or cough
7. Any change in normal bowel habits

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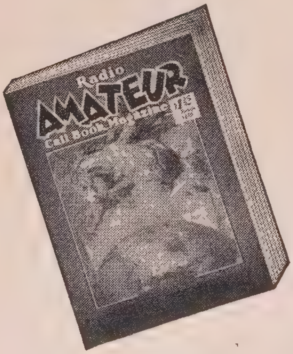

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VARIABLE SELECTIVITY

(from page 28)

vary the bandwidth anywhere from the sharp "ringer" to normal receiver selectivity and anything we choose in between.

The pot. control can be mounted on a small aluminum panel and held by the two lower corner screws holding down the FL-8 front cover. This makes for a neat simple wiring job.

If the most useful part of the desired bandwidth is a bit crowded at one end of the control, try reversing one of the outside pot. terminals, as your particular one may have a "trick" electrical resistance taper.

When installing the FL-8 in a cabinet-mounted receiver, the filter can be mounted practically anywhere inside and the bandwidth control out front on the panel, but it might be a good idea to run shielded wires to the pot. against possible a.c. hum pickup.

As with any bandpass filter, there is a reduction in over-all audio output due to "insertion losses" and bandwidth reduction. However, this condition is never really serious, since there is usually plenty to go on the volume control.

MONITORING POST

(from page 44)

11-minute audio mist on TV screens was due to a cable break in the remote pickup—it was a great night for the old-timers and the next such gathering will be held in 1959. . . . **W7LCM**, Mayor of Huntley, Mont., has added to his list of official "Dog Catchers" the Governor of his state, as well as Bob Hope—now Arthur Godfrey is sponsoring Dottie Lamour for the honor. . . . Anything can happen! Hearing **W6ZZ** on the East Coast with a good signal, the operator referred to the call book, called W6ZZ and found out there is but one of that name in ham radio—this old-time operator used to excel in traffic when his call was W1WV, and a QSO renewed friendships after 20 years between contacts.

W6HNP has high praise for **W6AOA** who has turned out 18 new hams in 1949, in addition to lending and giving some gear to get these new ops on the air. . . . **W6ASE**, on 10 with 300 watts and a 3-element beam, is an engineer for the Southern Pacific R. R. . . . On 3880 kc at 1830, EST, the Conn. Phone Net can be heard daily and at 1000 on Sundays. . . . **W8GBG** (Great Big Guy) weighs 250 at 6 feet, 4 inches, and wears size 15 shoes—does anybody have bigger feet? . . . Perhaps we can start a Big Feet Club. . . . **W4EVG**, who has been W3EVG, W5FTU, and W6WMF, has been transferred from Wash., D. C., and will soon be heard with a JA2 call on 10 phone and c.w., and 20, 40, and 80 c.w. . . . **W6SUP** is a cop and keeps KRPD, Roseville, Calif., police station on the air, though with his phone rig on 20 he's out for DX; he is also among the new officers of the Placer RC as v-p, with **W6OXG** carrying the presidency honors.

It is noted that the FCC, while not sending QSL cards to confirm reception of long-winded transmissions, has been sending cards calling attention to the rule regarding identification of stations at least every 10 minutes. . . . **W8EOZ**, 14-year-old night owl at Mt. Vernon, Ohio, claims he goes to bed early in order to be on the air at 0400 or 0500. . . . **W2QYT** has joined the Benedicks—congratulations, John. . . . **W6UNT** is a fireman in his home town—operates 20, 40, 80 c.w. and 2 and 10 phone. . . . **W1HYF** wants to know if the standard preamble on messages has been changed—traffic coming into the Conn. Net have several versions of preambles and they can't all be right—they go a long way toward confusing ops breaking into traffic handling; he also invites all Conn. stations to join the CN or CTN (Conn. Training Net)—drop a card to HYF for full info. . . . **W6KKL**, 10-meter phone with a pair of 100THs, is bent on DX QSOs.

WALKIE-TALKIE

(from page 17)

this regeneration, which spells the difference between insufficient and adequate tripler output. The second doubler is inductively coupled to the grids of the push-pull final. The doubler plate inductance is three turns of a B & W Mininductor. The 7-turn grid inductor of the final is of such diameter as to fit snugly inside this coil. The push-pull final merits little comment, for with adequate shielding it behaves normally in every respect.

The above-deck photo shows the parts layout pretty well. The mike transformer is at the extreme left end of the chassis, with the two modulator tubes just to the right of the transformer. The two changeover relays may be seen beneath the horizontally-mounted tube. The crystal is mounted on a bracket. Just beneath the crystal is the crystal-oscillator-doubler tube. The horizontally-mounted tube next to the crystal is the tripler-doubler. The horizontally-mounted acorn tube is the 959 r.f. amplifier of the receiver. Its grid lead extends through the center of the final tank inductance. One 958A of the push-pull final stage may be seen just behind the 959. The other 958A is not visible, being mounted in an inverted position just below the visible 958A. The final tank inductance, butterfly condenser, and one of the neutralizing condensers are visible between the 958A and the mounting bracket which supports the crystal and the low-power r.f. stages.

As an indicator to aid in the aligning of the exciter stages, a milliammeter is temporarily inserted in the grid return of the final. With 90 volts of plate supply, the grid current will be 1½ to 2 milliamperes. This milliammeter was also used in conjunction with a 50,000-ohm series resistor for a rough alignment of the exciter stages. With the positive terminal of the milliammeter grounded, the series resistor was temporarily tacked to the

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grid of the first doubler and the slug of the oscillator rotated for maximum indication. After this, the series resistor was tacked to the grid of the tripler and the first doubler tank tuned for maximum indication. The series resistor was then tacked to the grid of the second doubler and the slug of the tripler tank rotated for maximum indication. After this procedure, the chassis was fitted inside its case, and all stages were retouched for maximum final amplifier grid current. In the neutralization of the final, no plate voltage was used on this stage, and the neutralizing capacitors were adjusted so that no fluctuation of grid current was noted when the plate tank was tuned through resonance. The final amplifier is modulated by a pair of 3Q4 tubes in push-pull which, except for the method of obtaining grid bias as mentioned earlier in this article, is conventional. It might be a good idea to insert the milliammeter in the grid return of a crystal oscillator. If the grid current is found to be of a value appreciably different from 3.75 milliamperes, it may be advisable to employ a resistor of another value instead of the 2,000-ohm resistor to provide a 7.5 volt drop across it.

The Receiver

Except for the fact that the PA tank acts as a fixed-tuned circuit for the r.f. stage, the receiver section is more or less conventional. The r.f. stage is capacitively coupled to the super-regenerative detector. The dial and the knob on the panel are for detector tuning and regeneration control, respectively. The function of a two-stage audio amplifier following the detector is handled by a 3A5 tube. Finding no room for an output transformer to couple the audio output to a magnetic headset, a crystal headset was chosen. This is resistance coupled to the output of the second audio stage.

The performance of this "Walkie Talkie" has been very gratifying. Generally, everything that can be heard can be worked. S9 reports have been received at distances in excess of 50 miles, and many QSOs have been effected from inside hotel rooms. In horizontally-polarized areas many fine QSOs were carried on with the outfit laying on its side on a park bench so to place the antenna in a horizontal position.

WIDE SPACED ROTARY

(*from page 32*)

for yourself. You pays your money and you takes your choice.

Determination of Beam Impedance

What is the impedance of your beam? 20 ohms? 50 ohms? You don't know? Well, here's a way to determine it:

By the use of a low-powered signal generator, such as your e.c.o., in conjunction with a Micromatch and several pieces of line of different impedance, the beam impedance may be indirectly measured. This is done by substituting various transmission lines of different impedances between the Micro-match and the driven element of the beam. The S.W.R. is measured with each line. The line length should be the same in all instances, and the line should be kept straight and in the clear. If intermediate values of impedance are needed, a Q-section may be used between the line and antenna. Since the S.W.R. is directly proportional to the ratio of line impedance to antenna impedance, this may be calculated easily and the results graphed. A close, approximate value of antenna impedance may be found by interpolation. (*Fig. 7.*)

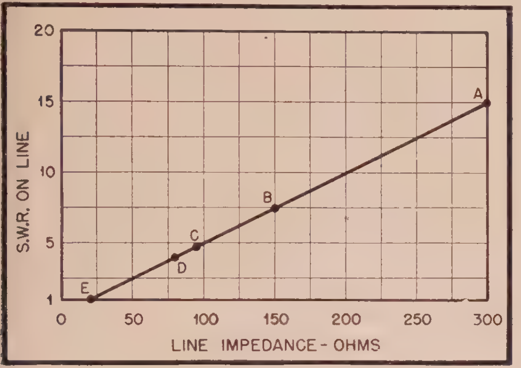

Fig. 7. When ribbon lines of 300, 150, and 75 ohms are used, the S.W.R. points "A", "B", and "D" are produced. Point "C" is produced by the use of a 95-ohm twin coaxial line. When the line A-D is drawn, it cuts the impedance axis at 20 ohms where the S.W.R. is 1:1. Thus the impedance at the feed point of this antenna is 20 ohms.

So that is the story, incomplete as it is. I hope it gives you a general idea of measuring your antenna performance. It is a great source of satisfaction to know just how the old beam is performing. With a perfect peace of mind that can be had with a smooth working beam, your blood-pressure will not rise an iota when that choice DX station comes back to Joe Blow instead of to you. You will KNOW that it is "just conditions!" 73 and CU on the low end!

MEET THE CAPACITOR

(from page 24)

possible to keep moisture from creeping in along the space, minute as it may seem, between the flexible leads and the body of the case. In military and good commercial equipment, all paper capacitors are hermetically sealed in metal cases to guard against this danger. The familiar "bathtubs" are paper capacitors having almost indefinite life when properly used within their voltage and temperature ratings.

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A-3126	$3.45	6V6, 6F6	RK18, RK58, T20, TZ40, T55, 807, 809, 838, 845, 35, 100T8

Type No.	Turn Ratio Pri. to ½ Sec.	Class.	Pri. M.A.	Mtg.
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type, since the thickness of the paper dielectric cannot be maintained constant with any degree of precision. The paper itself is a poor dielectric at any but audio frequencies, thus limiting these capacitors to by-pass and coupling circuits. As mentioned previously, maximum operating temperatures must not be exceeded, otherwise premature failures will certainly occur. But despite these disadvantages, paper capacitors are almost universally used and will be until a superior type is devised. When correctly chosen for the application at hand, they will be relatively trouble-free. A 100% safety factor in working voltage rating is excellent assurance of long life dependability!

Rectangular papers, and micas as well, are best mounted so that the least area is parallel to any grounded metal surfaces, especially when they are being used in higher frequency coupling circuits. This form of mounting reduces stray circuit capacities considerably. Bathtubs in similar circuits when mounted on small standoff insulators or bushings will have a few μμf strays to nearby chassis surfaces. Measurements taken with the same capacitors mounted firmly on the grounded metal have shown strays exceeding 100 μμf. Clearly, wide band amplifiers requiring large coupling capacitors for good low frequency response should not be burdened with stray capacities of such magnitude. Small points such as this often mean the difference between satisfactory and unsatisfactory equipment operation. The amateur who is well versed in the selection of components will be in a position to spend more time enjoying QSOs. For most people, "debugging" equipment is less pleasurable, indeed.

V.H.F.—U.H.F.

(from page 37)

He is hoping to take along his ARC5/T23 equipped for c.w. and n.b.f.m. for operation on the six, two, and 1⅓ meter bands. Oscar is a bit worried about where the materials for suitable antennas may be obtained. He is also investigating the possibility of making a rhombic for use on all three bands. His contemplated frequencies are: 50.1, 144.9, and 235.1 or 220.1, depending on the terms of his operating permit. We will try to keep you posted on this expedition, because the shot from the east coast across the Gulf Stream should be a fairly easy one for the DX addicts along the middle Atlantic seaboard.

Teletype Networks

John E. Williams, W2BFD, the "pappy" of amateur teletype operation, has set a new goal for the teletype fans—an inter-city network along the eastern seaboard. Teletype-equipped stations are ready in the major cities, with the New York area especially well covered. The work accomplished by the teletypists in the New York election reporting and the "Turkey Run" project have already been well publicized in recent news releases.*

---

* A. E. Hayes, Jr. "In the Public Eye" *CQ*, Feb. 1950, p. 14.

In Washington, D. C. W4JCV is the leader of activity, with W3CJE, W3NDT, and our *Mobile Corner* editor, W3NL (What, *mobile* teletype, Andy?), ready to go on the air on short notice. In Philadelphia, W3JPP is looking for coöperation in his TT tests. The biggest problem that these experimenters have to face in setting up an inter-city TT network is spanning the gaps between the major cities on the route. W3LMC in Baltimore has volunteered to act as a relay link, but he is still over 90 miles from the stations active in Philadelphia. Another tough 90-mile hop is involved in getting Philadelphia to New York City. Although there is a chance that by setting up "super stations" at vantage points in the terminal cities consistent contact might be maintained, a much more reasonable measure would be to establish relay stations midway along the route.

The advocates of teletype operation have many strong selling points for their particular phase of the hobby. A smooth-working teletype net is a joy to behold. Surely there are some hams located along the path of the proposed network who would derive great satisfaction from setting up and maintaining a teletype system as part of the inter-city hookup. To make a one-hop jump from Baltimore to Philadelphia, stations in the northern part of Maryland, central Delaware, or extreme southern New Jersey would be required. An alternate route, to the west, via the Lancaster-York section might also do the job, but probably two relays would be required. Stations in the central section of New Jersey should be able to relay from Philadelphia to New York in one hop.

We hope to have more news in the near future regarding the progress of this TT hookup. Meanwhile, if you are interested in teletype operations, contact Johnny Williams, W2BDF, for details. He will be glad to offer all possible assistance to those wishing to get started on TT. It is not as difficult or complicated to get a TT system on the air as you might believe!

Two Meter Notes

The stations along the Gulf Coast had a good night on the 25th of February, but there were, unfortunately, not many stations active at the time. W5DSB, W5QIO and W5QME were active in the Port Neches area, W5MKP and W5GIX of Baton Rouge, and W5MXJ and W5EM of New Orleans were logged at Port Neches. The following morning W5DSB and W5QIO were heard again, working W5IRP and W5FBT. Around 8:20 A.M. W5QIO worked W5DCV and W5BDT of Austin, W5ONS of Victoria, and W5JLY at San Antonio. Most of this activity was on horizontal polarization.

W5PRE in Dallas estimates that there are at least 15 or 20 stations ready to go on two meters in that area, but activity is sagging due to lack of day-in day-out activity on the band. The most popular equipment is the 522, more-or-less converted.

W5QFA of Corpus Christi passes along the information that he is set up with a 522 and a simple dipole, but that he is disappointed in the lack of regular activity and variety of contacts.

These fellows seem to need more inter-city contacts, to spur activity and to provide incentive to improve the equipment. We recently drew a close parallel between the coverage of a v.h.f. television broadcast station and that of a well-equipped amateur two-meter station. The fellows in the Dallas-

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Fort Worth area by now have a good idea of what kind of TV signals can be received in the outlying areas, and this should give them a mark to shoot at. There must be enough activity within the regular ground-wave range to insure plenty of good QSOs, and only by getting on the air and operating consistently will we be ready for the unpredicted band openings which will be coming up with increasing frequency during the summer season.

A project designed to improve the equipment of the typical "casual" two-meter operators is a demonstration of a good low-noise converter, such as the 6AK5-6J6 Wallman r.f. stage job, or the 6J4 G.G. front end, alongside a 522 or similar receiver. If a diode noise generator is available to show more obviously the differences in performance of the various receivers, the demonstration will be more convincing! This project could well be part of a club program to build up local two-meter activity.

Speaking of diode noise generators, required reading for the ham interested in the theory, design, and use of these handy little gadgets, is W8WJC's series of articles in the *VHF News* published by Bill McNatt, W9NFK. Another article which should be of interest to v.h.f. receiver designers is W1OOP's paper in March, 1950, *QST*. Henry describes several methods for feeding an un-balanced receiver input from balanced antenna feed lines. He also points out the importance of obtaining extremely tight coupling between the antenna feeder and the input circuit of the first r.f. stage.

Attention, 144-mc stations who have yet to contact the State of Maine. W2RXZ informs us that he will be operating from his summer place near Rockland, from about June 10 through the summer Bill hopes to have a high-powered final amplifier to drive with his Millen 829-B transmitter. His regular operating frequency of about 144.95 will be used He claims that he will be located on top of the highest ridge in Waldoboro, and if we remember that particular ridge correctly, Bill will have no trouble working out to the southwest!

Improving Receiver Selectivity

Although several stations, notably W3GKP and W3RUE, have shown what can be done by using straight c.w. and highly selective receivers on two meters, there has been some reluctance on the part of the average two-meter operator toward using c.w It is more common to hear stations using keyed-tone modulation (m.c.w.) than it is to hear straight c.w., in spite of the fact that c.w. offers far more effective gain in intelligibility. We should encourage the further use of c.w. to make possible good QSOs under poor conditions. However, it seems as though many of the gang have decided that c.w. techniques are too difficult to apply to 144 mc, and up. Perhaps the problem of receiver stability is the tough one Or perhaps the large numbers of receivers which are not equipped with BFOs has held up more general use of c.w. Those who are equipped for m.c.w. or those who have no good means for copying straight c.w. have still much to gain through adoption of greater receiver selectivity—in the audio channel The announcement of the "Select-O-Ject" reminds us that a tunable audio filter, set up to pass the frequency of the other felow's keyed tone, will help a great deal in pulling his signal through the background noise. Try it sometime! Best of all, the added selectivity does not impose stricter limits on receiver stability. The popular and low-cost type FL- tone filter in the "range" position makes a good audio filter and can be plugged right into the phon jack of most receivers. There is only one catch, it isn't tunable, but is peaked at about 1020 cycles. We might advance the idea that anyone planning to use m.c.w. on his rig should make an effort to set the pitch of the tone somewhere close to 1020 c.p.s.—maybe the guy on the other end has an FL-8 filter and read this paragraph!

Conversion of the BC-788 For 420 Mc

W7QLZ passes along the following tips on converting a BC-788 receiver for use over the 420-mc band. The adjustment screws on the i.f. coils have usually been cut off with the ends of the cans to avoid tampering. It is necessary to slot these studs with a fine jeweler's saw to accommodate a fine screw-driver. Clyde removes the swamping resistors on the first two (only) i.f. circuits to get the desired selectivity, and tunes these circuits on the nose. The screens of the first two i.f. tubes are tied together and come out to a 250,000-ohm pot for gain control. The last four i.f. stages are peaked closer together than normally to bring the pass-band down to about 2 mc instead of the original 5 mc. The 6AG5 2nd detector is left in place, and is made to operate as a power detector with about 25,000 ohms in the cathode circuit. The audio signal is then taken off the plate through a .05 μfd capacitor, and drives a 6C4-6AQ5 audio amplifier.

The front end is modified by soldering a small Johnson 160-102 condenser across the oscillator lines as close as possible to the tube. The shorting bar is then set to give a received frequency of 430 mc with the condenser half-meshed. W7QLZ's receiver tunes from about 415 to 440 mcs over the full range of this tuning condenser.

To further soup up the front end of the receiver, one can use the r.f. cavity, complete with 2C40, out of the latest model ASB7, and use it as a tuned r.f. amplifier ahead of the 788. Clyde has his r.f. stage mounted outboard, while W7KTJ rigged his inside the 788 case. The result—a very "hot" receiver, at least the equal of any which we have seen in use on 420 mc.

To make the picture even more attractive, Clyde built a small transmitter using a pair of 2C43s modulated by a 6N7 (class "B") into the space in the 788 case formerly occupied by the power unit. This yields a complete 420 mc station, with a 25-watt transmitter, all mounted in one compact housing.

The ATP5 with a lighthouse tube mounted in a cavity seems to be a pretty potent transmitter. It will stand inputs up to about 80 watts without complaining. This should give an output power pretty close to the legal limit.

We should not forget that the power limit of 50 watts *peak* into the antenna still applies. When 100% amplitude modulation is used, the *carrier* power at the antennal terminals should not exceed 12.5 watts! Of course, the feeder losses make it hard to reach this limit with the types of tubes we have available today, but when we look at some of the rigs now going into action on 420, we cannot help wondering when someone is going to remind us officially that the power restrictions are still valid.

That's about all the space for this month. gang. True to our prediction, W2PAU is now ready to go on ten and eleven meters. We know that we're getting out. When we first fired up the rig on eleven meters all the locals started complaining about terrific diathermy QRM! See you on the air . . . . 73. . . . Brownie, W2PAU

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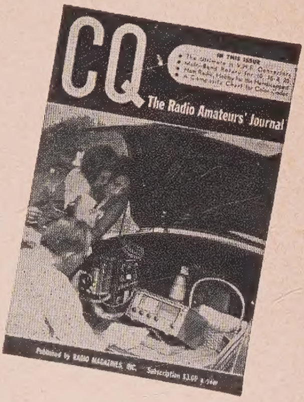

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American Radio Institute 58
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Barker & Williamson 10
Bud Radio, Inc. 2

Columbia Electronic Sales 59
Communications Equipment Co. 68

Editors & Engineers, Ltd. 71
Eitel-McCullough, Inc. 8
Eldico of N. Y., Inc. 48, 49
Electronicraft, Inc. 71
Electro-Voice, Inc. Cover 2
Esege Sales Co., Ltd. 58
Esse Radio Company 51

Fair Radio Sales 57

General Electric Co. (Tube Div.) 1
Gifts by Guildcraft 68

Hallicrafters Company 43
Harvey Radio Company, Inc. 53
Heintz & Kaufman 50
Henry Radio Stores 45

Instructograph Company 65

JFD Manufacturing Co. 64
Johnson, E. F. Co. 60

Kenyon Transformer Co., Inc. 54

Lettine Radio Mfg. Co. 67

Master Mobile Mounts, Inc. 6
Merit Transformer Corp. 65
Millen, James Mfg. Co., Inc. 4
Motorola, Inc. 67

National Company, Inc. 72, Cover 3

Offenbach & Reimus Co. 62
Overbrook Company, The 64

Petersen Radio Company, Inc. 7
Premax Products 56

Radelco, Inc. 68
Radio Amateur Call Book 62
Radio Corp. of America Cover 4
Radio & Electronic Parts Corp. 56

Sylvania Electric Products, Inc. 5

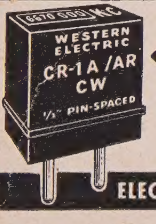
Trans-World Radio-Television Corp. 68

Universal General Corp. 66

V & H Radio Supply Co. 66
Vibroplex Co., Inc. 66

World Radio Laboratories, Inc. 47

YMCA 64



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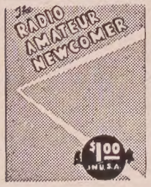

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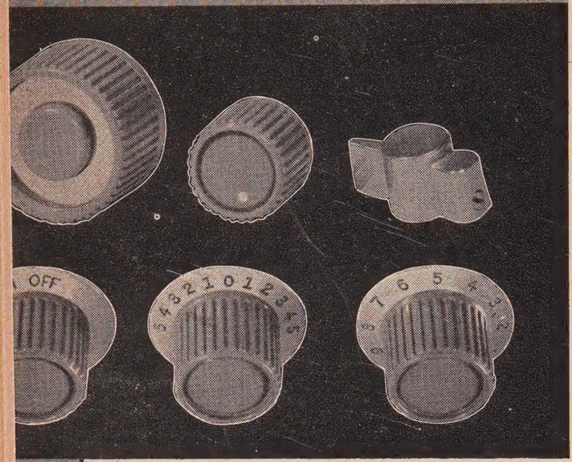

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DX & OVERSEAS

(from page 41)

have the results published within the next two months. For those of you who do long-range planning, it looks pretty much like the next contest will be the weekends of October 28th and November 4.

If any of you fellows happen to be in Chicago and around the Stevens Hotel during the week of May 22nd, give me a blast, because I will be there attending the Radio Parts and Electronics Show. Maybe we can corral a mob and have a noisy little clambake some evening.

Don't be a bit surprised if OM QD's activity picks up somewhat, as preliminary tests indicate that TVI has been licked. Why, only the other night, in practically three solid hours of QSOs, not one neighborly phone call was recorded. This wasn't the only event of the evening, because skip was apparently right, and I started knocking off W9s. . . . Need I say more??? 73.

QTHs

CR5AM	Armando Mariano, P. O. Box 206, Bissau, Portuguese Guinea
FF8JC	Box 566, Dakar, French West Africa
FN8AD	Hatkhola, Chandernagora, French India
HZ1AB	APO 616, c/o P. M. New York, New York
KB4AK	D. Costantino, Navy 115, Box 18, c/o FPO New York, New York
LU3ZB	Via LU8FL
MC1BH	Via RSGB
MD2PJ	Box 66, Tripoli, Libya, or via RSGB
VQ2AB (ex-G3BIQ)	Via RSGB
ZE3JJ	Ivan Wood, P. O. Box, 1557 Salisbury, Southern Rhodesia

SCRATCHI

(from page 4)

to use this toob on his ranch, on acct. he not wanting to pay the light bill if I do. Also, wires coming to our ranch would only act as fuse if Scratchi pulling any high current from line. If using 110 volt line I would need 10,000 amperes. The only sensible place to use this toob are place with plenty of power and plenty of water. Scratchi is all fixed up on this, as I have reel good friend that works at Boulder Dam.

My friend and I are figuring that we can build small shack neerby and run wires from powerhouse without much trubbles. Also having plenty of water around, so there are reely no problems at all to putting megawatt station on the air.

Excoosing me, Hon. Ed. but postman are just coming with letter from RCA that I wrote them asking how much this 5831 toob are costing. . . . Hmmm, well, maybe there is a slite problem. Hon. Ed. would you be interested in lending Scratchi a cupple of thousand bux until next pay day? I will even telling AC4YN to look for you. Please answering hastily.

Respectively yours,
Hashafisti Scratchi